The
Electrical Review

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Installation Rules

HOW far is an undertaking legally justified in requiring that the installations of its consumers shall comply with the I.E.E. or any other regulations? We exclude factories or mines, as the electrical equipment of these is governed by regulations of the Home Office and Mines Department that are of a more detailed character than those made by the Electricity Commissioners.

Any authority to require compliance with the views of an undertaking as to the necessary standard to be attained is valid only in so far as it relates to definite purposes.

These purposes are the prevention of danger, of leakage, and of the use of electricity in such a way as to interfere with the supply to another consumer; the danger envisaged is from shock, burns or fire, but the provision in Clause 27 (iii) of the Commissioners' Regulations as to the control of a motor by the operator might imply a regard for non-electrical risks also.

Rules that attempt more than the fulfilment of these purposes would be *ultra vires*. Even the I.E.E. Regulations, in so far as they are designed to promote such otherwise desirable features as standardisation, would not be applicable in all cases. This is probably the chief obstacle to their compulsory adoption as a whole; one undertaking (West Ham) has done so, but only by virtue of powers afforded by a special Act.

The references to them in the Commissioners' Regulations merely imply recognition of their ability to meet the requisite conditions for safety; they do not necessarily, as Mr. J. W. Thomas pointed out in our issue of March 2nd, invest them with statutory significance. Mr. Thomas also questioned whether the permission accorded undertakings to withhold supply to installations applied to those connected before the beginning of next year.

Effective inspection would present a serious problem, more particularly with regard to apparatus installed after the supply had been started, as wiring can be passed or condemned at the outset. We have seen many a house where shoddy apparatus has been connected to excellent wiring.

Should not apparatus be marked by some central body to signify that it has been constructed in accordance with I.E.E. recommendations?

In an article in this issue Mr. G. S. Lowther suggests that the I.E.E. Regulations should be made a minimum rather than a maximum standard; but, apart from the objections that could be lodged against this course as outlined above, there are some who would fear lest this should lead to a stereotyping of existing methods, which might not prove ultimately to be the best possible for securing the prime requisite of safety.

We have pointed out some of the difficulties in the way of securing a measure of uniformity throughout the country. Such uniformity is, however, necessary if the electrical contractor is to feel reasonably secure that by employing really skilled workmen and sound material, and adopting the best-known methods, he will be able to carry out a job of work anywhere without fear of adverse criticism—but such a standard will be more difficult to establish than many suppose.

Mr. Insull and the Grid

A FEW weeks ago we mentioned the investigations that certain American electrical authorities had been making in this country of the design and progress of the grid. Probably by this time President Roosevelt's advisers will have placed before him their findings concerning a national electric power policy for the United States. Whether that be so or not, the American people have had an opportunity to learn something more than they knew before regarding the international standing of Mr. Samuel Insull as an authority on electric power expansion and organisation. The statements made by Mr. Insull last week during the inquiry at Chicago into the charges made against him have been treated by both the American and the British newspaper Press as sensational, but they have

not come as a surprise to a number of electrical men in both Europe and America who were in close touch with what happened a few years ago. While Mr. Insull informed the jury that never before had it been made public that in the year 1926 Mr. Stanley Baldwin, representing the British Government, offered him the " chairmanship of British high-tension power development," we may say that it was well-known here, as we stated in the ELECTRICAL REVIEW on August 24th (p. 236) that " while the British grid was either in process of birth or in the stage of early nourishment, the utility experience of Mr. Samuel Insull of Chicago was found helpful at Westminster." For some years he was a very frequent visitor to London, the city of his birth, was constantly in conference with well-known members of Parliament, and was recognised as a world leader in the expansion of electricity production and consumption.

The Inquiry Proceeding

To comment on the details of the charges made against him while the trial is proceeding may not be desirable but, for our part, we cannot express regret that Mr. Insull embraced the opportunity of letting the world know, as the Press has seemed to us to be disinclined to do for some time past, just what electrical advantages United States industries gained under the leadership and control which he exercised in the course of an exceptionally lengthy career devoted thereto. We abstract the reports of his reminiscences on a later page. It was reported that Mr. Hoover was to appear at Mr. Insull's instigation in order that there might be an appreciation in the mind of the Court of the atmosphere of prospective prosperity which prevailed when some of his measures were undertaken. Incidentally it may be remarked that the year 1926 quoted above was one of intense electricity supply interest in this country, and readers who have access to the ELECTRICAL REVIEW volumes for that period and several years preceding it may find it interesting to refresh their minds regarding the very close and critical analysis of electricity policy which appeared in our pages.

Contractors and Fair Trading

A FORTNIGHT ago we referred here to the course adopted by the I.M.E.A. in making known its attitude towards the Fair Trading Policy. We have now been privileged to learn from the official organ of another association what the contractors have to say concerning the self-same policy, for we read that at a recent Council meeting it was reported that a definite attempt had been made to get the Policy into operation with some of the schedules, although it was intended to cover all electrical appliances as soon as possible. It appears that it had been thought that the Policy should operate from October 1st, but delay was found necessary. These statements may not carry matters much further than some had anticipated, but why do our sectional interests need to hide even these little lights under official bushels?

Jubilee Illuminations

THE same policy of exclusiveness is demonstrated in the *Electrical Contractor* for the current month in relation to electrical illuminations for the Silver Jubilee of His Majesty's accession in May next. Immediately upon the publication of the announcement of the contemplated event, remembering previous public celebrations we indicated the importance of the occasion to the electrical installation contractor and suppliers of illuminating devices. We are glad to read that the Office of Works, in notifying the Association that a number of Government buildings will be floodlighted and illuminations arranged, asked the Association to appoint a representative to co-operate with them. The lot duly fell upon Mr. Riggs and we are confident that good will result. But the Jubilee will give incalculable opportunities to almost everybody in the electrical supply, contracting, wholesaling and small manufacturing world, and we must look well ahead so as to make Britain and the Empire lands of light, beauty and colour electrically in May, 1935, the year of the convention.

Altered Convention Arrangements

JUST at the moment of going to press with these pages there reaches us an official notice to the effect that " circumstances have arisen which have necessitated the alteration of the venue and date " of the National Electrical Convention. For Folkestone we now read Bournemouth, and June 17th to 22nd gives place to May 27th to June 1st. What the circumstances are is not stated, but under the altered arrangements the Bournemouth electrical convention is due to open just nine days after the Royal Jubilee celebrations close. The British Industries Fair at Birmingham, for which the promise of electrical exhibits and visitors is stated to be most encouraging, opens on May 20th and closes on the 31st, so that for part of the time the Fair and the Convention will be running simultaneously, one at Birmingham and the other at Bournemouth. Here is the list:—

May 6th-18th.—Jubilee Celebrations.
May 20th-31st.—B.I.F., Birmingham.
May 27th-June 1st.—National Convention at Bournemouth.

Pride of Possession

A FINE testimony to electric cooking comes from Bradford in the result of an offer made by Mr. T. Roles to sell his consumers (either outright or on hire purchase) the domestic apparatus which they have been hiring from his undertaking. So satisfied are the users of the various appliances with their performance and reliability that the offer has met with a ready response. Cookers, especially, seem to have excited the possessive instinct, and two-thirds of those who were formerly content to rent them have now become their permanent owners. This is one of those facts that provides its own comment.

The Tables Turned

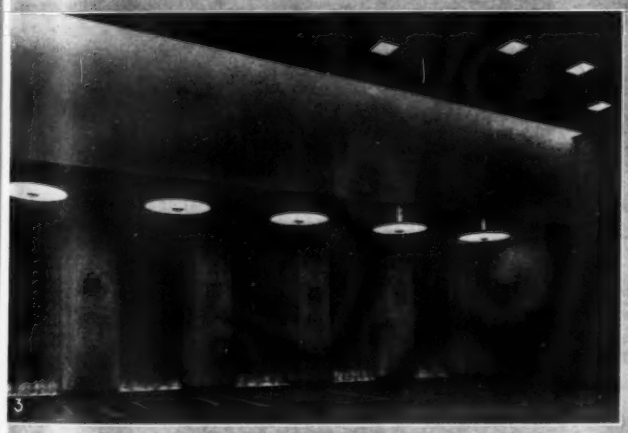
So often do we learn that " the fire was believed to be due to the fusing of an electric wire " that we are rather amused to hear of an electric wire which was most certainly fused by a fire. The incident is recounted in the current number of *Distribution* (Henley's). Just before the advertised opening of an electrical exhibition at Skegness a failure of the supply occurred in a wide area of that neighbourhood. Upon investigation it was found that some workmen had lit a bonfire under a 33-kV line, and the heat was so intense that it melted the lowest of the cadmium-copper conductors. The damage was quickly repaired under difficulties by the men of the Mid-Lincolnshire Electric Supply Co. and Henley's.

What Becomes of Them?

A NOTEWORTHY feature of the periodical lists of names issued by the National Register of Electrical Installation Contractors is the number of applications declined. The latest list contains seven acceptances and ten refusals. The rejection of so many prompts the question, " What becomes of these unsuccessful applicants? " Do they join (or remain in) the ranks of the hated " jerry wiremen," or does their rejection bring them to a realisation of their shortcomings and prompt them to mend their ways with a view to eventual registration? It would be nice to know, but the secret must remain locked in the bosoms of the local selection committees.

Russian Lamps

AT a recent meeting of the West Yorkshire Branch of the Electrical Contractors' Association the question of Russian lamps was raised. According to a report which we have seen one member said that he had obtained a sample quantity and the prices were " found to be 4s., 5s. and 6s. for 60 watt, 75 watt and 100 watt respectively, all gas-filled." Is this the " dumping " of which we have heard so much? If the prices are correctly given these lamps must be of an extraordinarily superior character to compete with the home-produced variety.



The New Headquarters of the Royal Institute of British Architects. **(See page 635)**

1. The exterior at night. 2. Looking into the Henry Florence Memorial Hall. 3. The interior of the Hall. 4. The entrance hall from the lower staircase. 5. The staircase to the first floor. 6. The Library.

The I.E.E. Regulations. By G. S. Lowther, B.A., A.M.I.E.E.

Comments on the new edition and some questions

THE requirements of the I.E.E. Regulations for the Electrical Equipment of Buildings are, generally speaking, clearly and definitely set out. I would like, however, to draw attention to certain important instances of ambiguity and impracticability upon which it would be advisable to obtain immediate definite rulings from the I.E.E. and to consider the unsatisfactory position in which these Regulations now place the electrical contractor.

Clause No. 116 calls for an automatic leakage trip when the normal working current exceeds 100 A, unless the resistance of the "earth continuity path" is sufficiently low to ensure the operation of the breakers or cut-out in the event of an earth fault. The earth continuity path will include the earth resistance at the power or transforming station, the resistance of the supply conductor, the earth resistance at the installation, the resistance of the earth (*i.e.*, the soil) between the power station earth and the installation earth, and the resistance of the earth fault on the piece of apparatus concerned.

Assume the case of a 230-V circuit protected by a fuse with a normal working load of 100 A (the fuse operating instantaneously at $2\times110=200$ A); the total resistance, R, of the earth continuity path must not exceed $230/2\times100=1.15$ ohms. How is it intended that this total resistance shall be measured, and is it reasonable to think that even under the most favourable conditions the resistance could be limited to 1.15 ohms?

Clause No. 201 sets out in detail the arrangement required for a final sub-circuit. In effect it limits the loading to 15 A or ten points, whichever is the smaller, and specifies the size of fuse which must be used for the various ratings. The latter is a most important point which frequently receives only the most cursory consideration, and in practice the current rating of the fuse is often greater than that of the cables and flexible cords which it is intended to protect. It would appear, however, that no provision has been made in a final sub-circuit for such appliances as vacuum cleaners, irons and kettles.

Raising the Cost

Take the case of a vacuum cleaner on a 230-V circuit, for example. The current consumption may normally be less than 1 A, but, to comply with the Regulations, this must be supplied from a 5-A socket outlet, and not more than three such outlets, necessitating a minimum cable of 7/.029, can be fed from a sub-circuit. It is the general practice in large houses, hotel and suites of offices to install a separate system of socket outlets for vacuum cleaners, but if such an installation is to be carried out in strict accordance with the Regulations, the cost will be prohibitive. In the same way the cost of installing the smaller appliances, with the exception of clocks and radio for which special provision is made, will put them out of court; consequently the Regulations will need modification in this respect if they are not to be infringed.

Clause No. 206 states that a switch lampholder must be provided with further means of control in a readily accessible position in the same room. This is similar to the previous Regulations and no doubt it will be dealt with in a similar unsatisfactory way by making the "further means of control" the withdrawal of the plug from the socket, particularly since Clauses Nos. 208 and 209 permit the use of live sockets without switch control. I consider that this is the most astonishing item in the whole of the Regulations, and I cannot understand the reason for allowing such a dangerous condition to exist, particularly in view of the footnote to Clause No. 209.

Clauses Nos. 1001 to 1008, dealing with "earthing," are a very definite improvement on anything which has appeared in previous editions. They were very clearly analysed by Mr. T. C. Gilbert in the ELECTRICAL REVIEW of September 14th, but in addition to the points which he raised I should like to draw attention to the following:—

Switches in Bathrooms

Clause No. 1002 (D) indicates that the switch in a bathroom should be out of reach of a person in the bath, but it will be found that this is often impossible in practice; in some blocks of flats recently built the bathroom measures approximately 6 ft. by 4 ft. with a ceiling height of from 8 ft. to 9 ft. The footnote to this clause which suggests that the switch be placed outside the door does not appear to be a practicable solution of the difficulty, since it has already been received with disapproval by architects and probably would meet with greater disapproval from private users.

Clause No. 1005 specifies the maximum resistance permitted for the earth and the earth continuity conductor, but the really important matter which sums up the whole object of this clause is to be found in the footnote which in effect states that "it is desirable" that the leakage potential should not be allowed to exceed 50 V before the circuit-breaker or fuse comes into operation and isolates the faulty circuit. It is a pity that the footnote without the words "it is desirable" was not substituted for the whole clause. The essential point is to limit the leakage potential to a safe figure, which cannot be done under the conditions of this clause except in the case of comparatively small currents.

Since the resistance of an earth has been defined, it is necessary to adopt a means of measuring that resistance. Clause No. 1110 states that this shall be carried out by the fall of potential method, either by means of separate apparatus and instruments or, preferably, by means of a combined earth tester. For isolated rural installations this is very suitable, but for installations in built-up areas it is impracticable because of the space required for placing the auxiliary earth electrodes with their leads.

I will emphasise the necessity of employing a.c. for earth testing; I recently listened to the chief engineer of an old-established firm of installation contractors explaining how he tested earths by means of a battery, an ammeter and a voltmeter.

What is the Contractor to Do?

What is the position of the electrical contractor with regard to the new Regulations? Is he to put them into operation or is he to ignore them? This question must apparently be answered by the supply engineers, since the Regulations are not legally binding. Under the Commissioners' Electricity Supply Regulations, 1934, supply undertakings are empowered to accept the I.E.E. Regulations as a standard in certain instances. It is unfortunate that the Regulations were not specified as the minimum standard required.

Some undertakings may institute their own rules, with the result that the contractor may have to estimate to a different specification in each supply area in which he carries out a contract. He may even require to stock a different class of material and apparatus for the various areas and to instruct his men in the different methods which may be required in their work. Unless this question is settled without delay we must expect to see "jerry wiremen" flourishing at the expense of the installation engineer.

One large undertaking operates a set of rules for carrying out deferred-payment lighting and heating systems, which are not only contrary to all regulations, including those of the Commissioners, but are definitely dangerous. I consider that no reputable firm of contractors would risk working to such rules, and, consequently, it must see the work carried out by others.

This serious position should be settled at once, preferably by the Electricity Commissioners, but, alternatively, by the supply authorities. An agreement must be reached which will either enforce the I.E.E. Regulations in every supply area or will lay down the minimum standard necessary. Also, steps must be taken to ensure that such an agreement is properly carried out by the appointment of qualified and experienced engineers to inspect installations both during the progress of the work and on completion.

Electrical Progress in Ceylon

The annual conference of the Engineering Association of Ceylon, which has just completed twenty-five years of active work, was held recently in Colombo under the chairmanship of Mr. B. G. Meaden. In his presidential address, Mr. Meaden gave a résumé of the work of various Government departments during the past year. Regarding the Electrical Department, the speaker said that at the Stanley power station the maximum demand reached during the year was 2,950 kW, and it was necessary to transfer load during the peak hours from the Stanley to the Pettah station. The Pettah power station was in continuous operation, and there had been no serious interruptions in the supply of power. The total kWh sold was 10,930,827, the cost of production being Rs.805,350, while the revenue derived was Rs.18,47,956. Electric power was becoming more popular, since the year under review recorded an increase in the number of consumers of over 10 per cent., the figures having risen from 5,969 to 6,698. Further progress has been made during the year in the development of new areas and increasing the number of streets in Colombo served. Approximately 19,394 yd. of overhead and underground mains and services were put into use. The capacity of new installations connected was 1,203 kW, as against 960 kW in the previous year. The demand for industrial motive power continued to be steady, although prevailing conditions had adversely affected that class of load. Nevertheless, the advantages of an economical rate are being realised and electricity is slowly but surely replacing other types of prime movers.

The R.I.B.A.'s New Home

THE Royal Institute of British Architects has moved to Portland Place, into new headquarters which were formally opened by the King and Queen yesterday (Thursday).

What Mr. G. Grey Wornum has made of the opportunity offered by the choice of his design in open competition with 283 others can only properly be judged at first hand. The new building is in numerous respects a notable achievement.

The highly decorative possibilities of electric lighting have been exploited in novel ways. In this respect the result obtained by Messrs. Waldo Maitland & Partners is outstanding. Many of the methods employed are entirely original, exhibiting a refreshing newness by comparison with the artificiality too often associated with what is loosely termed architectural illumination.

The exterior is floodlighted by lamps concealed beneath flat glass slabs set horizontally in the stone surround, expressly designed to impart a shadow effect to the sculptures which relieve the simple frontage.

From the narrow entrance hall one looks up the grand staircase into the interior of the Henry Florence Memorial Hall through great screens of silver bronze and etched glass, which have added an unexpectedly striking effect to the scheme of illumination. Rectangular pressed glass coffer lights recessed into the lofty ceiling are the main source of light for the staircase well. Tubular lamps concealed in the silver bronze bases of the etched glass balustrades illuminate the glass edgewise.

The air-extraction system

The entrance hall receives light from two rows of five inverted saucer domes set in the low ceiling close to the walls, so as to utilise the reflection from the polished stone with which they are lined. Level with the ceiling below each dome hangs a shallow plain-glass dish, through a hole in the centre of which projects the end of a single 60-W lamp, the projecting portion of the bulb being silvered to throw the light upward.

Similar ceiling domes with slightly differing pendant glass discs are used on the landings, and continued on the first floor down each side of the imposing Henry Florence Memorial Hall. This is the principal apartment in the reception suite and it has two separate systems of lighting. Illuminated glass steps at the window sills casting light up the curtains add to the decorative aspect of the two side rows of ceiling domes, while two pairs of 120-ft. long "Claude Neon" carbon dioxide discharge tubes slotted into the raised central portion of the ceiling cast white "daylight" downward with striking effect.

Powerful reflector lamps recessed in the higher central portion of the roof, to which access is provided through the library floor above, augment the illumination when the hall is used for examinations and exhibitions. An adjoining reception room is lighted by four large torchières flooding the ceiling, which acts as a diffusing reflector.

The lecture theatre is the Henry Jarvis Memorial Room. Its illumination, which is controlled by "Igranic" dimmers, comes indirectly from concealed sources in the sills of three long windows on each side at ceiling level. The end wall can be lowered to afford overflow accommodation in the foyer, which is lighted indirectly from one end only by two large floor standards flooding the ceiling.

The library contains one of the largest and most valuable collections of books of its class in the world, comprising over 40,000 volumes. The reference section is arranged on the open access system, the rounded metal ends of the shelving enclosing the heating radiators insulated from the books behind by cork. Lighting is by means of reflector lamps inset in the tops of the bookcases shining on to the smooth ceiling.

The stack room along one side is provided with rows of naked pearl bulbs surrounded by light metal hoods perforated with irregularly shaped holes, to interrupt the line of vision rather than act as reflectors. These rows of "Luxfer" lamps are controlled by "Snead" time switches that automatically extinguish the lamps after a predetermined interval.

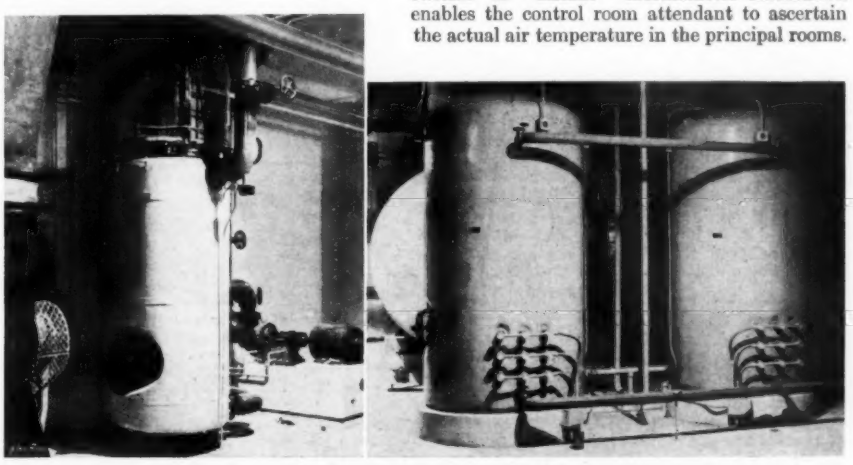
The Council Chamber is at the top of the building, and receives natural light through high end clerestories. Artificial illumination is directed upward on to the ceiling from the side walls panel cornices. Committee rooms are similarly lighted indirectly by floor standards flooding the ceilings, while the basement cloak rooms have fittings inset in the wall and ceiling angles and between mirrors.

The lighting fittings were specially made to Mr. Maitland's designs by Messrs. C. Harvey & Co., Best & Lloyd, Ltd., Troughton & Young, Ltd., Osler & Faraday, Ltd., H. H. Martyn & Co., and Allom Brothers, Ltd., for whose direct and indirect standards the 20th Century Electrical made large "fabric rhodoid" pleated lampshades. Benjamin reflectors have been used with "Osram" lamps besides those supplied by Tubelamps, Ltd. Glass dishes for the lighting fittings were supplied by Robinson, King & Co., and pressed glass by Chance Bros. & Co.

Heating and Ventilation

Moderate temperatures and air velocities spread over large surface areas characterise the heating and ventilating systems. Mr. W. W. Nobbs, the mechanical and electrical consultant, has succeeded in preventing any duct, heater, or piping being visible anywhere. Fresh air is admitted high up towards the ceilings from behind wall panelling, while the vitiated air is extracted through numerous small grills in the floors, under the seats in the lecture theatre and Council Room. The heating and ventilating plant was installed by Messrs. G. N. Haden & Sons, Ltd., and Matthews & Yates air conditioning plant with motor driven fans is employed.

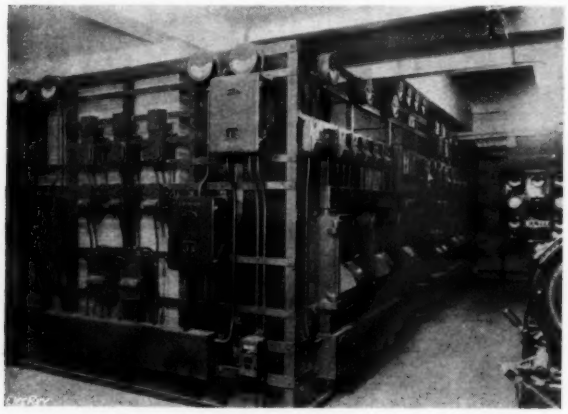
For heating "Ideal" radiators and "Solray" (Comyn Ching & Co.) panels are concealed in the floors, walls, and ceilings. The water circulating through them is heated on the thermal storage principle with electricity used only during off-peak periods, controlled thermostatically and by time switch. A "distant" thermometer installation enables the control room attendant to ascertain the actual air temperature in the principal rooms.



The thermal storage and electrode boiler installation

A 500-kW Sulzer 3-phase electrode boiler connected through a Ferguson, Pailin circuit-breaker directly to the 6,600-V mains, with two Ruston & Hornsby storage tanks, provides a thermal capacity of 16 million B.th.u., or sufficient for twelve hours' heat loss.

The water can be heated during the night to 260 deg. F. without boiling, the maximum circulating temperature being



The switch room

135 deg. F., while automatic mixing of flow and return normally keeps the circulation temperature at 120 deg. F. The electrode boiler operates under full automatic control in respect of temperature, pressure, circulation, overload, and out of balance.

For the provision of domestic hot water there are two boilers each fitted with nine 2-kW Percival Nobbs immersion heaters under thermostatic control.

Two service and two gearless Waygood-Otis passenger lifts have been installed. They are push-button operated and self-levelling. Although the car may be occupied the lift will automatically stop at any landing on which the appropriate "up" or "down" button has been pressed. The gates are self-closing and the speed is 400 ft. per minute, the lift travelling from the basement to the top floor in nine seconds.

Smith's bi-synchronous master clock system has been installed. This is normally driven off the mains; should the supply fail, the clock circuit would be automatically switched over to trickle-charged batteries. Public address equipment by R.M. Radio, Ltd., serves the larger halls. Soft speakers are fitted into the ceiling for reinforcing speech and relaying from one hall to another. The outfit can be used also for reproducing gramophone records and radio reception. Post Office telephones are provided throughout.

The electrical contract was carried out by Messrs. Pinching & Walton, who used Glover's wires and cables, Longmore conduit, Walsall conduit boxes, Wandsworth interlocking switch-plugs, Brookhirst switchgear, Wm. White distribution boards, and Nalder Bros. & Thompson measuring instruments. Rubber flooring has been laid by the India Rubber, Gutta Percha & Telegraph Works Co., Ltd.

The Marylebone Corporation's step-down transformer substation has been conveniently housed under the side street pavement in what were the coal cellars of the houses which formerly stood on the site of the new building.

Two-part Tariff Prepayment Meters. By S. A. Daines, Grad.I.E.E.

Advantages and shortcomings of the available patterns

THE essential difference in the construction of the two-part tariff prepayment meter, compared with the ordinary prepayment type, is that an extra component for collecting the fixed charge rotates one sun wheel of an additional differential gear, while the revolution counter of the watt-hour meter drives on the other sun wheel. In effect, the planet wheel travels always in one direction and is geared to one side of the normal differential gear, thus debiting fixed and running charges against the coins-inserted portion, which obviously operates in the reverse direction.

Such items as wiring, hire, or "high rate" unit charges can be collected by the operation of this part of the meter, whereas the "low" running charge for energy consumed is collected through the normal price change compound and kWh meter.

Types and their Differences

Most of the earlier makes utilised a Ferraris motor for driving the fixed charge portion, and by means of an adjustment of the shaded pole piece the speed could be varied from zero to 150 r.p.m., the higher speed representing amounts ranging from 4s. to 6s. per week, according to the make of meter.

Later, several manufacturers made use of a small self-starting synchronous motor, which rotated at a constant speed and was geared to special "weekly charge" compounds, the scope of these being very large, in stages of a penny per week. The latest types of this pattern have eliminated the necessity of compounds by including an ingenious pawl and ratchet device by means of which the gear ratio can be varied by merely turning a screw. Experience has shown that both methods have advantages and limitations, the main ones being referred to below with suggestions for improvement.

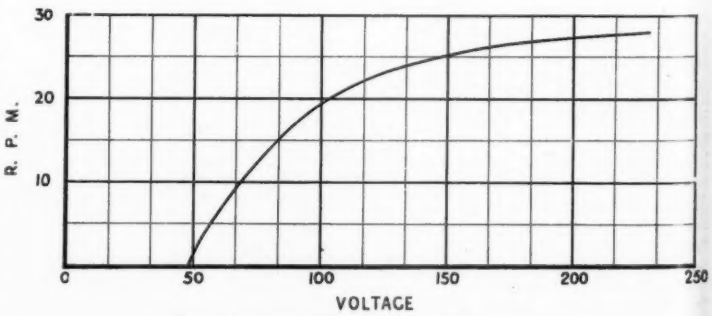
The synchronous type necessitates a controlled frequency, which is, however, now becoming more the rule than the exception. With some patterns it means the carrying of a large stock of "weekly charge" compounds, which, nevertheless, have the advantage of being easily changed by a junior man, as few tools are required, while the work can be carried out with a marked degree of reliability.

The original patterns of the standard 230-V synchronous motor were unsuitable for pressures under 150 V, but in the new type the motor will start automatically at 90 V. As many undertakings still use dual voltages, a meter suitable, without adjustment, for either pressure becomes invaluable, as carried stock can be reduced.

The Ferraris type originally caused some trouble owing to the fact that it was found to be running about 12 per cent. slower on circuit than it had been set to do in the test room. Subsequent investigation proved that this was owing to the wave-form of the testing circuit incorporated, in which there was a phase shifter.

Although it is possible to calibrate the Ferraris motor to very fine limits, it is, I think, a disadvantage, where the collector makes adjustments on circuit, in having to carry a stop-watch. The motors will operate satisfactorily at pressures of from 100 to 250 V, which suffices for normal needs. The accompanying curve shows that they will continue to rotate at any pressure exceeding 50 V, and, further, within the allowable variation of 6 per cent. from the standard voltage there is no appreciable deviation from the meter's calibrated speed.

As to running cost, on test the watt loss per meter, taking the fixed charge motor and shunt coil combined averages 3.8, and with 5,000 meters this represents over £200 per year if calculated on the grid scale of charges. As an increasing number of undertakings are purchasing their energy this becomes an item of no mean importance.



Speed/voltage curve of a Ferraris motor

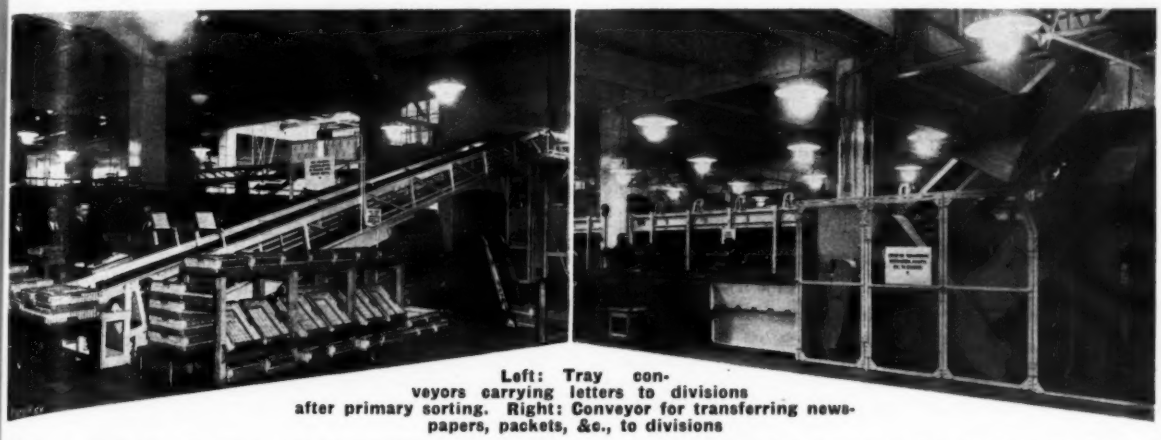
On the whole, the meters now available fulfil most requirements and at a price approximately 25 per cent. above that of the ordinary prepayment type; they are good value, and have, I think, a great future, seeing that they meet the needs of the wage-earning class of consumer whose aim is to pay weekly for the electrical energy consumed and the apparatus hired.

A revision of the Specification governing the size of terminal holes is, in my opinion, necessary, however, because they are often too small to accommodate separate leads for lighting, heating, cooking, and power circuits. Stout insulated covers are becoming more universal, but an additional improvement would be gained by fitting unbreakable windows as well as by placing the coin slots in a more accessible position than on the top of the meter, where several manufacturers still situate them, often necessitating the use of a chair for the insertion of a coin.

The Mount Pleasant Extension

THE new Post Office building at Mount Pleasant, London, is planned to give uninterrupted floor spaces and is constructed of steel with reinforced concrete floors and walls. The basement, which on the west side is at street level, is to be used as a garage.

The ground floor and part of the first floor are occupied by the letter-sorting office, which is 2½ acres in extent and the largest of its kind in Europe or the Empire. The second floor is divided between administrative offices and stores. Beneath the building is the largest station on the electrified railway connecting the various depôts through which 800 trains run daily.

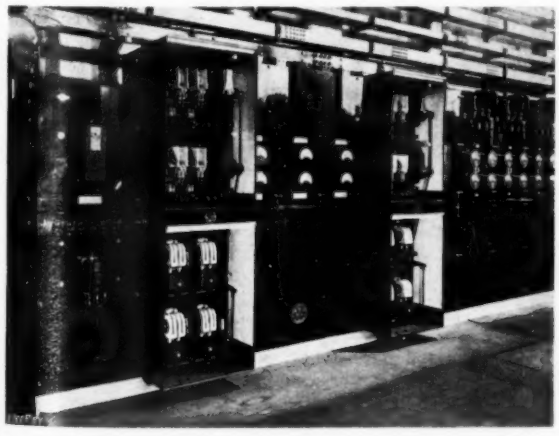


Left: Tray conveyors carrying letters to divisions after primary sorting. Right: Conveyor for transferring newspapers, packets, &c., to divisions

The new sorting office is extensively electro-mechanised. A two-way conveyor carries in one direction the letters from each facing table to one of the fifteen stamping machines, which can deal with 700 letters per minute, and in the other direction packets for hand stamping, via a chute, and feed and main conveyors to two pairs of tables in tandem.

Two other conveyors bring packets from branch offices and the provinces. The overhead conveyor band fitted to each pair of tables is provided with electrically controlled diverters which turn the packets into a storage trough and thence to the stamping table beneath.

After stamping, the packets are transferred manually to three sorting fittings, each comprising nine units. Below each of the four rows of units is a conveyor band on to which the boxes (which have collapsible bottoms) are automatically discharged in rotation by synchronised electrical control, thirty seconds elapsing between each discharge; a complete clearance of all the boxes is effected every three minutes.



Some of the a.c. switchgear at Mount Pleasant (covers removed)

Two of the conveyor bands run to each end of the fitting and discharge to a quick-rising twin-band conveyor feeding a system of overhead distributing bands running to the secondary sorting areas and fitted with diverters, the operation of which is synchronised with the opening of the bottoms of the boxes of the sorting fittings.

The new quick-rising conveyor (designed by the Post Office engineers), of which fifteen are installed, normally works at a slope of 60 to 65 deg., but 70 deg. is practicable and saves considerable floor space. It consists essentially of a plain belt conveyor, which carries the load, overlaid with a loose heavy conveyor, running at the same speed, which holds the load in place. This type will cope with loads varying from loose letters up to mail bags weighing 60 lb. Experience has shown that while the plain belt is inefficient for a slope exceeding 18 deg., it is the best where space is available.

A special overhead system of tray conveyors has been installed for carrying letters that have passed the primary and sorting stages to the divisional areas for secondary sorting and dispatch. Two further conveyors are associated with the bag-opening table, and six bag conveyors run to different destinations, including spiral chutes to the electric railway, from which arrivals are brought up by bucket elevators. Considerable staff time is saved by the use of a double-track escalator. This takes employés to the roof, which is connected by a bridge with the third floor of the old building.

In the basement are four rotary machines for cleaning the bags; these are to be replaced by machines to clean each bag separately by suction.

The Duke of York, in declaring the new sorting office open on November 2nd, briefly reviewed the history of the Royal Mail since it was initiated by King Edward IV in 1482 to the present time. He paid a tribute to the Postmaster-General and his part in bringing about the improvements in recent years. The ceremony opened with the presentation of a bouquet to the Duchess of York by Miss Mary Kempe and an introductory speech by the Postmaster-General, Sir Kingsley Wood, who stated that 17½ million letters and packets were handled at Mount Pleasant each week, half between 4 and 8 p.m. Although the work was so highly mechanical, it could not compensate for any relaxation in the trained skill of the 5,000 men employed.

Mr. A. Creighton (London Postal Superintending Officers' Association) moved a vote of thanks to their Royal Highnesses, and Lt.-Col. F. H. Kempe (controller of the London Postal Service), in thanking the Postmaster-General, attributed the high reputation which the Post Office enjoyed with the public to-day very largely to the close contact which it maintained with the Press.

Corrosion of Wire-on-Steatite Resistances

Repeated failures of wound-wire resistances in mains-operated radio receiving sets led E. Schürmann and W. Esch, of the Berlin-Dahlem State Institution for the Testing of Materials, to investigate the cause of the trouble. In a communication published in *Elektrotechnische Zeitschrift*, the authors present photomicrographs showing typical examples of the corrosion of the wire and the discoloration of corresponding points on the supporting insulator. A resistance of 0.05 mm. dia. chromium-nickel wire, for instance, was corroded at many places and was there so brittle that it broke at the slightest touch. Wherever corrosion occurred there were reddish brown specks in the steatite insulator. On removing and analysing splinters containing these specks they were found to contain pyrites. The insulating tube was very porous steatite rich in kaolin; small quantities of magnesium sulphate and chloride dissolved from it in hot water. The presence of pentagonal crystals of pyrites, sometimes superficially converted into iron oxide compounds, was definitely established in several resistance tubes. Further investigations showed that pyrites crystals attack nickel and chromium-nickel alloys vigorously in the presence of moisture containing small quantities of soluble neutral salts, such as sulphates or chlorides of alkaline earths, electro-chemical action being then established. These conditions are fulfilled in the wire-wound resistance tubes. The electrolyte appears only to be catalytic in effect and the complete action is rather complex, but the primary cause lies in the insufficient burning of the tubes, leaving unchanged pyrites in the insulator.

Avoiding Accidents. By F. D. Parker

Simple precautions with domestic appliances

IF the fewness of fatalities attributable to the domestic use of electricity is a criterion of efficiency, supply authorities have no cause for alarm. Accidents that do occur are usually of a mild character, and the majority are definitely not due to faulty workmanship, design of apparatus, or absence of adequate regulations, but to carelessness and incorrect use of appliances (especially portable apparatus) and to neglect and ignorance of the regulations.

All contractors should be registered and able to produce proof of having a comprehensive knowledge of the requisite regulations applicable to the work undertaken. Membership of the E.C.A. or National Register is, therefore, most desirable, if not essential.

Supply authorities can materially assist in raising the general standard of efficiency by the organisation of periodical inspections of installations and, more especially, by restrictions relating to the connection of further loads to existing installations without re-testing; but much depends upon the consumer, the contractor and the design of apparatus.

The public must be taught to be electrically minded without raising apprehension concerning the safety and efficiency of electrical apparatus and equipment. Regulations dealing with electrical installations should be confined to contractors and those directly connected with the maintenance of electricity supplies. It is enough for the average householder to adopt new ideas in the way of electric cooking and water heating without his being further bewildered by rules applicable to the employment of the apparatus when installed.

Points Regarding Design

The customary practice of equipping small appliances above 0.5 kW with lamp adaptors should be discouraged, as often the result is overloaded wiring and excessive sub-circuit fusing. Kettles, radiators and wash boilers should also be designed to avoid the possibility of burns and scalds. Kettles should be capable of being refilled from any type of tap without the risk of burns by steam issuing from the heated elements.

Reflector plates which are sometimes employed with dual-purpose hot plates and grills should also be provided with thermally insulated handles, as they often have to be removed when hot. The connecting adaptor should be fixed to irons and kettles at places remote from the hand when in use, thus minimising the danger of a burn if flex "shorts" at the point of entry to the adaptor. The provision of unkinkable flex for all portable apparatus is another point worthy of consideration; the consumer must realise the detrimental effect of winding the flex like a bundle of string when not in use. The fraying of flex at points of entry to lampholders, adaptors and plugs has been materially reduced by the improved design of such equipment, but it could be further reduced by the employment of specially designed insulated collars and sleeves.

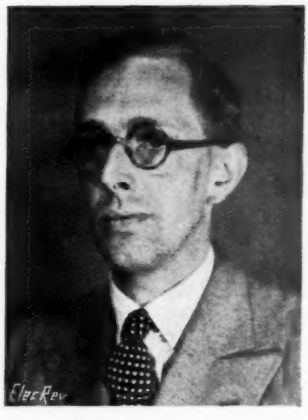
The new edition of the I.E.E. Rules deals more comprehensively with the provision of plug points. Limits are now laid down as to conductors for individual loadings; a further step would be to fix the wiring in proportion to the plug, and vice versa. I have advocated the placing of a notification upon the service boards to give an indication as to the section of the main service fuse, and the maximum loading of the sub-fuses, the limits not to be exceeded without the sanction of the supply authority. A similar measure could be adopted in instances where the wiring to existing plugs is discovered to be less or greater than the capacity of the plug. Colouring of the plugs would also promote a clearer understanding.

The increased use of multiple-plug points and multi-way plugs is desirable, especially in dining rooms where often many small appliances are in commission simultaneously. Such plugs should be fitted as near as possible to the place of use to avoid long lengths of dangerous and unsightly flex. However well such plugs and sockets are designed, repeated pulling out and reinsertion impairs the connecting flex.

Safe Plugs

Much progress has been made in the design of interlocking plugs and sockets, shock-proofing and shrouding so that contact cannot be made with half-inserted plugs. The use of synthetic resin is not without danger, unless it is reinforced with fibre or metal, as its tensile strength is usually poor. A fracture or break will not usually impair the electrical operation of plugs, and the tendency is to keep them in service in an unfit state. The fixing of connecting and locating screws directly into bakelite is another inadvisable practice as a little excess pressure upon the screw will often fracture the connections.

It is open to conjecture whether direct earthing to water pipes (considering that there is no visible indication that these are not touching gas pipes) is more efficacious than direct earthing to the lead of the main service cable. Moreover, there is a danger of exposed earth connections, especially in kitchens, becoming loose or broken.



Mr. F. D. Parker is on the engineering staff of the North-Eastern Electric Supply Co., Ltd.

The advisability of nailing earth wires to woodwork or skirting is also questionable and not without danger in some circumstances. Such earth wires may be called upon in the case of unusual faults, as those due to changes of polarity, and wiring errors, to carry severe short-circuit currents, thus causing a potential risk of setting the woodwork on fire. Precautions should apply to unexpected eventualities besides the usual anticipated faults. Contact with woodwork is generally unavoidable, but efforts should be made to obviate this wherever it is possible.

In bathrooms, kitchens and nurseries it is wise to exercise special precautions. No portable apparatus should be used in bathrooms, where all metallic apparatus should be bonded and connected to earth. This implies that shaving pots, mirrors, and similar appliances should be supplied from earthed and recessed wall sockets with embedded wiring. In damp places considerable care should be taken when choosing the position of plug sockets and switches. The employment of bakelite fittings in such places is no criterion of safety.

Now that thermostats are of high efficiency there is no reason why the supply of hot water for nursery use should not be regulated for a temperature enabling children to manipulate the apparatus without danger of burns and scalds. Night lights, always dangerous near inflammable material, can easily be replaced by neon or low-wattage lamps. Low-temperature panel heating or recessed tubular heating likewise contributes to the safety of nurseries.

The Importance of Good Lighting

Efficient lighting in the home helps largely in the avoidance of accidents not directly attributable to the use of electricity. This is especially the case in passages, on stairways and near kitchen sinks. Much depends upon the forethought and ingenuity of contractors when new installations are designed. The replacement of fuses by consumers often gives them confidence, although the provision of suitable fuse wire by supply authorities is advisable. Better still is the increased use of cartridge fuses or small circuit-breakers.

The advancement of electric cooking has in some measure been deterred by the reported unsatisfactory experiences of new consumers unacquainted with the real facts, and the over-advocating of protracted demonstrations, special tuition and cooking apparatus. Any implication that electric cooking differs greatly from other methods is not conducive to development; the experiment of the 24-hour clock is clearly indicative of the sluggish response to the inception of new ideas.

The general public should be informed that electricity is perfectly safe and can be readily employed by the average individual for all purposes without previous experience. It is only by inspiring confidence that the maximum rate of development can be secured.

Electro-Surgical Units in Australia

At a recent sitting of the Australian Tariff Board, Mr. L. Parer, director of the Stanford X-Ray and Radium Co. Pty., Ltd., supported a proposal that electro-surgical units should be removed from the by-laws under tariff item 419 (c) (2). He said that while the present exchange rates enabled his company to compete, the position would change if the exchange rates returned to normal. It was necessary to obtain finance for plant and for increasing sales, and without some assurance of the present protection being maintained in the event of a fall in the exchange rates, the company did not feel justified in incurring an anticipated additional expenditure of £4,000.

Hysteresis Loss in Steel. By E. C. Wadlow, Ph.D., B.Sc.

The relationship to magnetising force at low values

IN the design of most apparatus employing permanent magnets a knowledge of the B-H demagnetisation curve between B_{rem} and H_c suffices; this information is obtainable from books and makers' catalogues for all the magnet steels commercially used. In some instances, however, as in small self-starting synchronous "hysteresis" motors, use is being made of the energy loss occurring during complete cycles of magnetisation.

The published figures of hysteresis loss for various magnet steels are almost invariably maximum values, obtaining only when the flux density in the steel at each end of the magnetisation loop approaches the saturation value. Table 1 shows roughly these maximum values for some commercial steels.

TABLE 1.—Maximum Values of Hysteresis Loss.

Steel.	Ergs per cycle per cu. cm.
0.9% carbon ...	130.000—160.000
6% chrome ...	200.000—230.000
6% tungsten ...	220.000—260.000
9% cobalt ...	500.000—600.000
36% cobalt ...	800.000—900.000

At first sight it might appear that the 36 per cent. cobalt steel, having the greatest loss per cycle per cu. cm., would be the most effective, but this is usually far from being the case. Utilisation of the maximum figures for the high-cobalt steels necessitates the employment of continuously applied alternating magnetising forces which are quite impracticable on account of the resulting temperature rise of the magnetising coil. If, as often happens, the magnetising coil is wound on a stator and operates in conjunction with a rotor of magnetic material separated from the stator by air gaps, as in a motor, the difficulty is accentuated.

While, therefore, a value of H_{max} of over 1,200 c.g.s. units per cm. may be necessary to saturate a 36 per cent. cobalt steel, it is usually impossible in practice to employ a value of H_{max} greater than about 150 c.g.s. units per cm. for continuous operation in small machines. What is required, then, is a knowledge of the relationship between magnetising force and hysteresis loss for comparatively low values of the former, and this information can rarely be obtained from published literature.

Some information on this question is given in fig. 1, which illustrates tests made on various steels over a range of values of H_{max} up to about 300 c.g.s. units per cm. Table 2 shows the dimensions of the specimens, which were in the form of unbroken rings. The analyses and heat-treatments of the steels, where known, are given in tables 3 and 4, respectively.

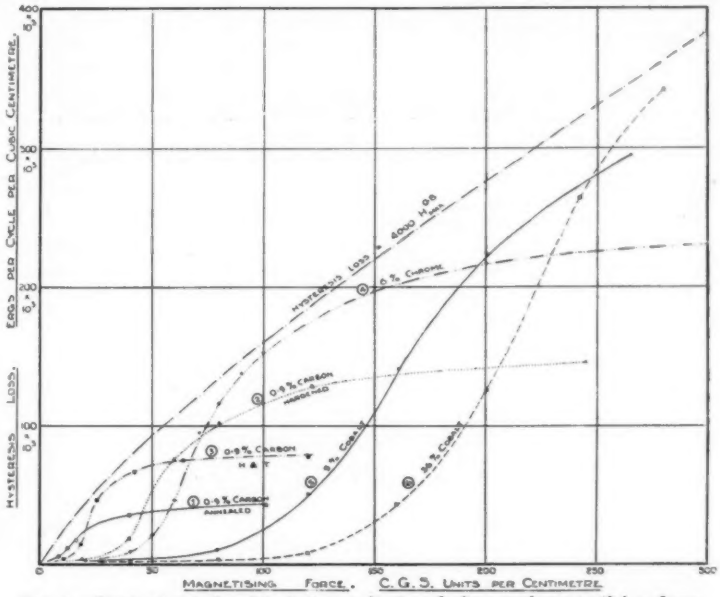


Fig. 1.—Tests of relationship between hysteresis loss and magnetising force

The hysteresis loops were obtained by the orthodox method of reversing the magnetising current from the tip of the loop each time, using a fluxmeter to indicate the change in the value of B. The areas of the plotted hysteresis loops were measured with a planimeter.

TABLE 2.—Dimensions of the Test Specimens.

No. of Test.	Steel.	Outside dia.	Inside dia.	Thickness.	No. of rings in sample.	
		in.	in.	in.		
1	0.9% carbon...	1.755	1.313	0.026	10	Rolled sheet
2	0.9% carbon...	1.755	1.313	0.026	9	Rolled sheet
3	0.9% carbon...	1.755	1.313	0.026	10	Rolled sheet
4	6% chrome	1.745	1.313	0.032	8	Rolled sheet
5	9% cobalt ...	1.745	1.313	0.082	4	Rolled sheet
6	36% cobalt ...	1.765	1.375	0.75	1	Casting

TABLE 3.—Analyses of Steels.

No. of Test	Steel	Analysis, per cent.					
		C.	Mn.	Si.	S.	P.	Cr.
1, 2, and 3	0.9% carbon	0.91	0.34	0.14	0.025	0.058	—
4	6% chrome	0.73	0.23	0.44	0.027	0.014	5.98
5	9% cobalt	Not analysed					
6	36% cobalt	Not analysed					

The method of plotting hysteresis loss against H_{max}, as adopted in fig. 1, is informative in that it shows that each steel will give optimum results over a limited range of values of H_{max} only, whereas by plotting the loss against B_{max} a series of non-intersecting curves is obtained. These curves are only very roughly parabolic (the Steinmetz law assumes them to be parabolic), and require a knowledge of the B-H curve of the material for their interpretation.

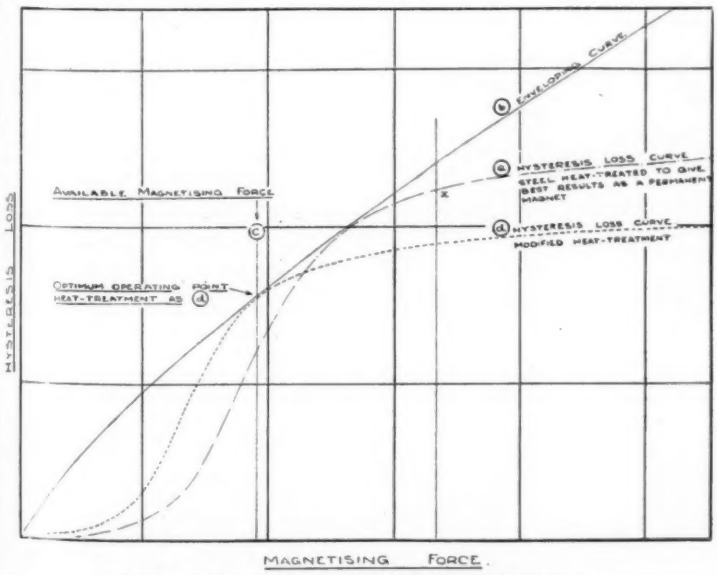


Fig. 2.—The selection of heat-treatment and material

TABLE 4.—Heat-treatments.

No. of Test	Steel	Heat-treatment
1	0.9% carbon...	Annealed at 790° C.
2	0.9% carbon...	Oil hardened from 790° C.
3	0.9% carbon...	Oil hardened from 790° C; tempered at 380° C and quenched.
4	6% chrome	Not known
5	9% cobalt ...	Heated to 1,150° C; allowed to cool in air. Heated to 700/750° C; allowed to cool in air. Heated to 1,000° C; cooled in air until magnetic, and then quenched rapidly in oil.
6	36% cobalt ...	Heated to 940° C; and quenched in oil.

It will be apparent, too, that for magnetising forces up to about 200 c.g.s. units per cm. the energy loss per cycle per cu. cm. due to hysteresis is much greater with tungsten, chrome and carbon steels than with the com-

monly used cobalt magnet steels. The envelope of the curves of fig. 1 is approximately parabolic; the envelope shown satisfies the equation: hysteresis loss $=4{,}000\ H_{max.}^{0.8}$.

If the true envelope is a simple curve, a knowledge of its shape would enable the maximum possible hysteresis loss for any given magnetising force to be quickly determined. The optimum operating point for any magnet steel would be at that value of magnetising force for which the hysteresis loss curve for the steel touches the envelope. As the number of magnet steels commercially available is fairly limited, it is important that the heat-treatment should be appropriate to the magnetising force available.

This is illustrated by fig. 2, where (a) is the hysteresis loss curve for the magnet steel as heat-treated to give best results as a permanent magnet, *i.e.*, to give a maximum value to the product B×H for corresponding values taken from the demagnetisation curve between B_{rem} and H_c. The envelope to which reference has been made above is shown at (b). If the magnetising force available is as indicated at (c), it will be seen that the steel is not giving the maximum loss which is possible for this magnetising force.

A slight variation in the heat-treatment might be employed to displace the loss curve to (d) so that it touches the envelope at the abscissæ value that is equal to the available magnetising force.

Thus the steel may be utilised more effectively in this particular application even though the value of B×H, which it will now give as a permanent magnet, is not the highest possible. Should the magnetising force ordinate intersect the curve (a) on the other side of the knee, as at x, a change of steel to one capable of giving a higher loss at this value of H_{max} is indicated.

Built-in Machine Tools. By P. J. Shipton

Special points in the design of control gear

THE direct electrical drive has been in vogue for a number of years on the larger kinds of machine tools, such as planers, large lathes and grinding machines, but its application to smaller ones is quite recent. This development has been assisted by the motor manufacturers, who have produced variable-speed a.c. and d.c. motors of compact and pleasing appearance, and special stator and rotor units for building inside machine-tool castings.

The increased use of a.c., permitting the utilisation of the robust squirrel-cage motor, has also assisted, as this machine is very suitable for machine-tool applications when frequent starting, stopping and plugging have to be provided for. Squirrel-cage motors have been designed that are capable of being plugged thirty times a minute, and control gear for use with these motors must be suitable for the same duty.

Design Problems

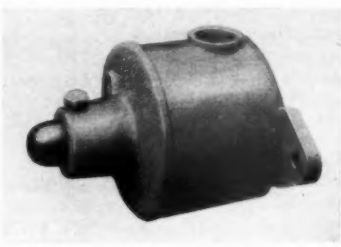
The main object is the production of an improved machine tool, and the problems most frequently encountered in the design of control gear for this service include keeping the cost within the limits specified by the machine-tool manufacturer, who, in his turn, has to keep it within reasonable relationship to the cost of the machine as a whole. The equipment must fit into a small space, without dangerously reducing electrical clearances. The gear must be of robust design for withstanding frequent operation by workmen who are, from the electrical point of view, unskilled. Its finished appearance must be of a neat and pleasing character. Machine-tool manufacturers are still rather inclined to look upon electrical control gear as a necessary evil and, in some cases, to consider cost as the only factor when deciding the type of electrical equipment to be fitted.

How much trouble is experienced in designing a compact arrangement can be realised if we consider the case of a four-speed switch suitable for the starting and speed control of a 1-h.p. motor driving a sensitive drilling machine. This motor may be built into or on to the machine tool, and must be of a proportionate size. The motor may be approximately 12 to 14 in. in length and the diameter 10 in.

A control switch of the face-plate pattern requires thirty studs to deal with a motor of the four-speed change-pole type and is arranged with four speed positions, an "off," and frequently a plug reverse position also. The outside diameter of the controller must not exceed the diameter of the motor, in order to give a neat and pleasing appearance. Moreover, electrical clearances have to be arranged for voltages up to 500; the notching mechanism and details generally must be of robust design; and connection arrangements have to be allowed for.

With a frequency of operation up to thirty times a minute electrical contacts and all working parts must be of the best possible design and workmanship. Power should never be carried through springs, hinge pins, or the like; there should always be a definite connection direct from contact face to the point where the outgoing connection is fitted.

On a 1-h.p. four-speed controller a slipper-type contact has proved very satisfactory. This contact enables the overall height of the switch to be reduced to a minimum, has a wiping and cleaning action over the fixed contacts, and is self-aligning. Against this, the pivot point is not in the ideal position for operation of the switch in both "forward" and "reverse" directions, but by suitably shaping the contact the risk of any stabbing action is minimised.



A special kind of limit switch

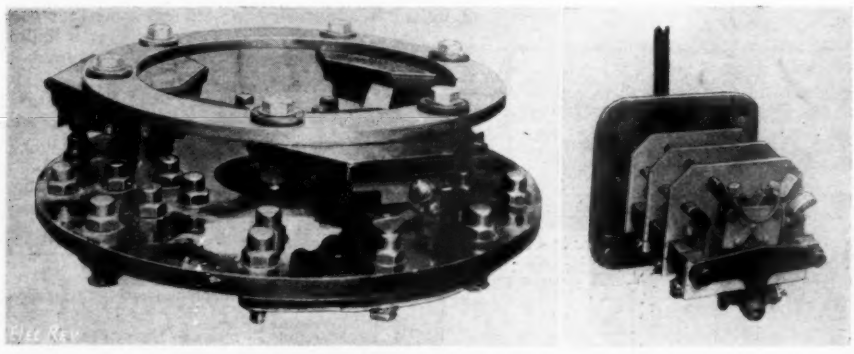
The rolling-butt contact is suitable for the straight-on starting and reversing of a.c. motors up to 5 h.p. and up to 500 V. This switch forms a compact unit and can be fitted into a cavity in the machine-tool casting. The special type of limit switch illustrated has given satisfactory service on machine tools that are frequently operated. The contacts are of the push-button type, and a hardened steel knob is operated by a lever or striker on the machine.

Finished Appearance

To obtain a good finished appearance the electrical and machine-tool designers must work in close co-operation. Consideration has to be given not only to the question of the control gear being suitable for building into or on to the machine, but also to the complete electrical equipment, drive, and control in conjunction with the machine layout. Cable runs, position of limit switches, and arrangement of the master control point are important questions which should be considered before the machine tool is built.

The design and development of control gear for machine tools require a good deal of experimental work, including carefully planned tests for endurance, breaking capacity, current-carrying capacity and speed of operation. The tests have to be carried out, first, at the control-gear manufacturer's works, with conditions arranged as nearly as possible to those under which the gear will operate, and, finally, the machine-tool manufacturer must test the apparatus over a period of time in conjunction with his machine.

I am indebted to Messrs. Brookhirst Switchgear, Ltd., Chester, for the photographs used to illustrate this article, which show three of a range of switches specially developed for machine-tool application.

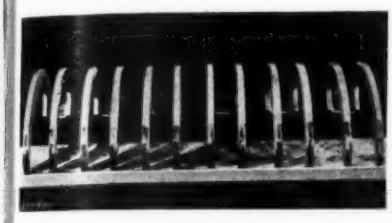


Slipper-type (left) and rolling butt contacts

A New Air-blast Oil Circuit-breaker

By Reginald O. Kapp, B.Sc., M.I.E.E.

As a result of six years of development work the Montreal Light, Heat & Power Co. put a new type of air-blast circuit-breaker into commercial service last summer. It is installed on a 132-kV system at Beauharnois power station. The breaker was designed by the company and was preceded by a number of experimental breakers for lower pressures, the first of which was designed for 4,000 V. The power station is a hydro-electric one and owned by the Beauharnois Light, Heat & Power Co. It is built for an ultimate capacity of 2,000,000 h.p. and is interconnected with three other power systems, namely, the Montreal Light, Heat & Power Co., the Montreal Island Power Co., and the Shawinigan Water & Power Co. The total present interconnected plant capacity is 750,000 h.p.



A set of moving contact rods

The essential novelty of the new breaker is that it is of the multi-break type, a number of breaks being arranged in series, of which each deals with about 12,000 V. The 132-kV breaker now in service has twelve such breaks in series. This principle removes any practical limitation to the voltage to which a breaker on the air-blast principle can be put. In this respect it differs from air-blast breakers at present on the market, which are of the single break type, and can be built up to 220 kV without auxiliary contacts.

An important requirement of a multi-break breaker is that the voltage shall be the same across each interrupting point. This is not necessarily ensured because the electrostatic capacity between various parts of the construction varies and is liable to cause too great a voltage to occur at certain breaks only. With the Montreal type of breaker this possibility is avoided by a high resistance which shunts the contacts. This allows just enough current to flow to equalise any electrostatic charges and acts, in fact, as a potentiometer.

Construction of the Moving Contacts

The design details of the new breaker at present available are very meagre and are particularly insufficient to make it possible to judge of its performance from a mechanical point of view, but the reports so far received indicate the general lines of construction. The moving contacts are in the shape of rods bent to the arc of a circle and connected together in pairs at one end. The opposite ends fit into the fixed contacts, which are so arranged that when the breaker is closed the current pursues a zig-zag path through the contact rods and fixed contacts all in series. The stack of contact rods is arranged vertically and moves about a vertical axis through about 90 deg. of a circle having about 10 in. radius. Each contact rod moves in a separate arc chute, which has a cross-section of 0.5 sq. in. and travels far enough in this to provide 12 in. separation from the fixed contacts. A set of moving contact rods is illustrated.

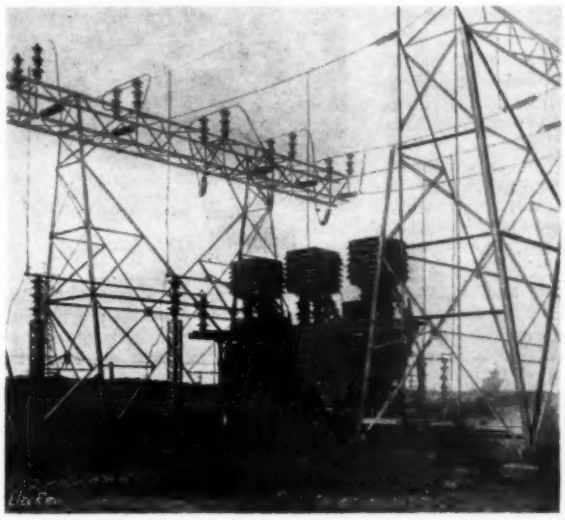
Operation is by compressed air at about 100 lb. per sq. in. This air is admitted through a valve underneath the stack of contactors and passes into a vertical distributor having a side outlet to each arc chute. It is claimed that the air reaches each at absolutely the same moment, ensuring simultaneous operation of all breaks.

The first action of the air is to blow the "fixed" contact ¼ in. radially outwards, breaking contact with the movable contact rod. Thus an arc is set up which is rapidly blown along the arc chute. As the space in this is partly filled by the movable contact rod, only ¼ sq. in. effective cross-section area is available for the arc, while the total cross-section of the arc chute is 2½ sq. in. The air velocity in the confined space is great, and, therefore, the arc is carried rapidly down this, while at the same time the movable contact rod is increasing the break.

The arc chute opens into a diffusion chamber having 4 sq. ft. horizontal cross-section. This is of rectangular shape and the effect of the corners is to break up the ionised air and mix it with a quantity of cold air. The diffusion chambers for each arc chute are separate so that any danger is avoided of a short circuit between adjacent arcs. The diffusion chamber moreover has the effect of keeping the arc from the outer air.

A resistance is fitted in each arc chute with two contacts and connected so as to shunt the arc after it has reached the contacts. This causes a successful reduction in the amount of current which can be carried by the arc, the remainder passing through the resistance. The current at the arc is thus limited at the final break to a maximum value of 1,200 A. A further effect of the resistance is to bring the current in phase with the voltage, thus facilitating final rupture.

In order to ensure against restriking of the arc, an automatic isolator, also operated by compressed air, opens within a third of a second of the operation of the breaker itself. This causes all voltage to be taken off the breaker. A second hand-operated isolator is provided as an integral part of the equipment and this allows 14 ft. to the nearest live metal for cleaning and overhauling. One of the illustrations shows the complete apparatus during tests for rupturing capacity. The equipment is 25 ft. long, 20 ft. high, and 15 ft. wide. The contact-breaking gear is inside the cubicles at the top of the equipment. These are 4 ft. square each and there is one to each phase; the height is 4 ft. This height is determined by the number of breaks in series, each adding about 3 in., so that a breaker of the same type for 275 kV would have a contactor stack 7 ft. high. The total weight of the apparatus is 25,000 lb.



An air-blast circuit-breaker at the instant of opening a short-circuit on the system

Reports of the tests conducted on this type of breaker indicate that currents of more than 5,000 A have been successfully broken without any serious damage and that no audible detonation occurs during operation either on light or heavy burdens, the only noise heard being a hissing due to the escape of compressed air. Closing, as well as opening, is effected by compressed air, current being needed only for valve operation. The current required for opening is 10 A and that for closing less than 1 A. A trickle of dry hot air is allowed to pass through the breaker continuously to keep all parts dry and to avoid any risk due to ice formation.

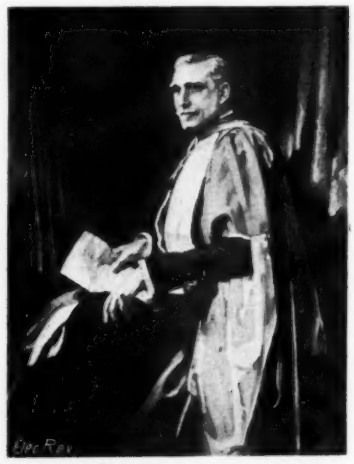
It is reported that the tests conducted before the breaker was taken into service were wholly satisfactory. An oscillo-

An oscillogram made during the test

gram of one of them is reproduced. This shows that the total time from application of the fault to its clearance was about ten half cycles at 60 periods. Allowing for relay time about 1 cycle, and for the time it takes the solenoid to complete its stroke, only a few cycles are left for the period during which the breaker itself is operating, and it appears that this time is less than 0.05 second. It is reported that after six short-circuit tests with increasing rupturing burden none of the contacts showed appreciable burning and, moreover, that such burning as was observable was equal on all contacts, proving that the voltage taken by each was about the same. Further particulars of the circuit-breaker are obtainable from Mr. W. A. Smith, consultant and patent specialist, 172, Buckingham Palace Road, S.W.1.

Ferranti's Life and Letters

FERRANTI was an inventive genius—that much we all know. We know also that to his work, probably more than to that of any other man, we owe the progress made in the electrification of this country. "Some of his admirers call him the 'English Edison' . . . . but I shall call him by his own name and no other"; thus a contributor to a London journal wrote in 1891 with remarkable perspicuity, Ferranti being only twenty-seven years old at the time. Yet as much is owing to the man himself as to his work; the "Ferranti faith," which right from the inception of the Deptford transmission scheme in 1888 had made his chief aim in life the electrification of the whole country, has been an inspiration to many others.



The late Dr. S. Z. de Ferranti (from the portrait presented to the I.E.E. by Mr. H. Marryat)

The reason for the influence that he undoubtedly had on the minds of all with whom he came into contact may be divined from a revealing biography which has just been published ("The Life and Letters of Sebastian Ziani de Ferranti." By G. Z. de Ferranti and R. Ince, pp. 240. London: Williams & Norgate, Ltd., 12s. 6d.). We are told that the qualities he admired most were intelligence, moral character, and devotion to duty. His complete lack of vanity—he was as reluctant to talk about himself as he was eager to discuss his work—no doubt prevented his appreciating that these were the very qualities that, with gentleness and courtesy, so eminently distinguished his character. The reader is fortunate—just as Ferranti was fortunate—that his wife was in full sympathy with his aims and had a complete understanding of his nature. The letters written to her by her husband not only give intimate glimpses of his essential self, but contain also continuous notes of work in progress that, taken with the other accounts given here of his plans and achievements, indicate the magnitude of the difficulties he had to face and overcome. Mrs. de Ferranti writes with clearness and distinction and most commendable restraint.

The early life of Ferranti, which is dealt with in the first portion of the book by Mr. Richard Ince, is likewise an excellent study of considerable interest, technical as well as personal. Ferranti could not have helped coming to the top, but it was a fortunate chance that threw him into association with Francis Ince so early in his career, thus enabling him to place his ideas at the disposal of the world without loss of time. The student of heredity may find something to ponder over in the descent of Ferranti, on both sides, from artistic and musical types; yet his interest in childhood was in none of these things (though they may explain his attitude to his work), but in locomotives and other mechanical objects, of which he had many acute observations to make in the letters he wrote to his parents from school.

His enthusiasm regarding the prospects of electricity in the home was publicly expressed as long ago as 1894. This enthusiasm never wavered, and, as Miss C. Haslett reminds us in a foreword, it meant much to the Electrical Association for Women in its early days.

The impression left on the reader of this well-compiled and well-balanced volume is that here was a man as great in his simple human aspects as he was in his creative intellect and work.

The London and Home Counties District

THE area covered by the annual return of the London and Home Counties Joint Electricity Authority for 1932-33 is 1,820 sq. miles and includes the counties of London and Middlesex and part of the counties of Herts, Essex, Kent, Surrey, Bucks and Berks, with a population (1931) of just over nine million.

The number of supply undertakings concerned is eighty-five, nearly one-eighth of the total for the whole country, operating twenty-five selected stations (about one-fifth of the total) with an installed capacity of 1,730,000 kW, of which one-third is municipally owned. There is a further 200,000 kW or so in non-selected stations.

Load factors of between 30 and 35 per cent., as returned by twenty-five undertakings, were the most usual. The aggregate maximum demand was 1,147,000 kW and the number of kWh generated was 3,378 million (31 per cent. by local authorities), an increase of 11.6 per cent. on the previous year, making 372 kWh per head of the population. Nearly three-quarters of the total was produced by sixteen stations of over 60,000 kW of installed capacity at a total cost of 0.428d. per kWh, including 0.230d. capital charges calculated at 8¼ per cent. In addition 990 million kWh was generated by six traction undertakings, bringing the figure of kWh generated per head to 481.

The total amount of energy sold exceeded 2,675 million kWh, of which 44.6 per cent. was for lighting and domestic purposes, 39.8 per cent. for power, 2.5 per cent. for public lighting, and 13.1 per cent. for traction. Power sales were up by 14.7 per cent. on the previous year, domestic uses having progressed less than any other at 7.9 per cent.

Revenue from each group in pence per kWh was:—Lighting and domestic, 2.32; power, 0.92; public lighting, 1.19; traction, 0.47; and bulk, 0.51; the reduction from the previous year was 0.091d. for domestic and 0.052d. for house. Heating and cooking supplies separately metered by 88 per cent. of the undertakings showed an average sum received of 0.93d. per kWh. Generating and bulk supply costs came out at 0.38d. per kWh; cabling distribution and management charges brought the figure up to 0.54d.—an improvement of 0.06d. over 1931-32, due to lower generating expenses.

The total capital expenditure at March 31st, 1933, was close on £114 million (31.5 per cent. by municipalities), of which £40 million has been incurred on generation, £60 million on transmission and distribution, and £14 million on hired apparatus and miscellaneous.

Of the surplus, amounting to £10 million, local authorities contributed £115,000 to relief of rates, £520,000 to capital outlay and special expenditure, and £227 to reserve (apart from sinking funds and loan repayments), while the companies paid £2,300,000 to ordinary and preference shareholders and transferred £2,656,000 to reserve and depreciation. Local rates imposed on municipal undertakings (£391,000) were 163 per cent. over those for 1920-21 and 127 per cent. over those for 1925-26. For the companies (£840,000) the percentage increases were 231 and 168.

The return also shows for each undertaking Orders, areas served, and date of starting of supply; particulars of system, plant installed, output, connections and load factor; kWh generated and number of consumers; capital expenditure, revenue and working expenses. There is also a table comparing the kWh sold in 1913-14 with the figures for 1928-29 onwards. An appendix gives details of the tariffs offered by every undertaking at the beginning of this year. This information was issued as a separate document earlier in the year, and was commented upon in the ELECTRICAL REVIEW of March 2nd.

Quick-starting of Fire Engines

A novel use for electric water heaters is described in the "Power Service Bulletin" of the Manchester Corporation Electricity Department. To achieve quick-starting for eleven fire-engines, "Caldwell" 1-kW blade-type immersion heaters have been fitted horizontally in a c.i. water container (12 by 2½ in.) which is permanently fixed to the chassis and connected by pipes to the water-jacket. The heater is continuously in circuit without a thermostat, radiator losses preventing the temperature rising much above 100 deg. F.

MEETINGS AND DISCUSSIONS

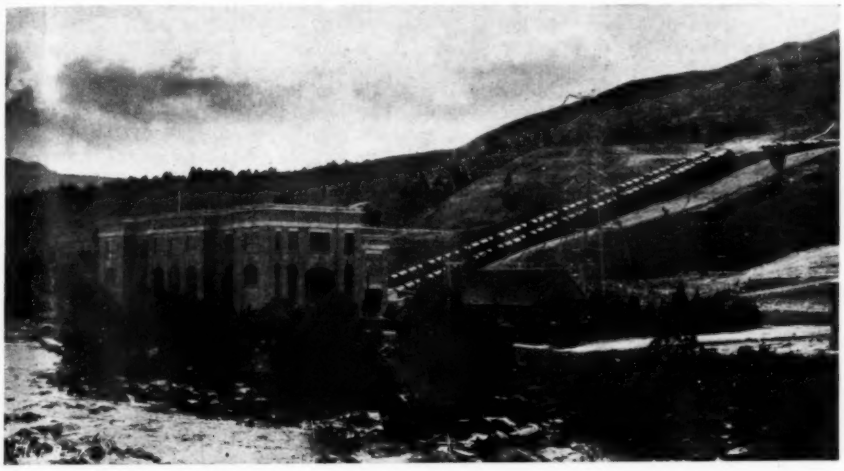
Current Topics and Opinions Expressed at the Institutions

British Water Power

HYDRO-ELECTRIC development in Great Britain, with special reference to the Grampian Co.'s works, is the subject of the paper by Messrs. A. S. Valentine and E. M. Bergstrom read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 8th.

The estimated continuous outputs at available economic sites are 20,000 kW in England, 36,000 kW in Wales, and 195,000 kW in Scotland. English municipal undertakings (635 kW at Chester, 320 kW at Worcester, and 750 kW at York) have utilised old mill sites with 9/11-ft. heads, their aggregate output averaging 5.25 million kWh per year.

The North Wales Power Co.'s plants with heads of 650/1,130 ft. (5,500 kW at Cwm Dyli, 15,400 kW at Dolgarrog, and 18,000 kW at Maentwrog) produce about 95 million kWh per annum, which total could probably be raised to 140 million kWh by increasing the available water supply, mainly at Maentwrog.



A view of the Grampian Electricity Co.'s hydro-electric power station at Tummel Bridge, Perthshire, on the shores of Loch Rannoch

In Scotland heads of 91/1,000 ft. are employed. The Clyde Valley Co. has two stations, 5,680 kW at Stonebyres and 9,840 kW at Bonnington. The British Aluminium Co. utilises 5,000 kW at Foyers, on the Caledonian Canal, 23,000 kW at Kinlochleven, on the West Coast, and 33/37,000 kW at Fort William (Lochaber). When the last-mentioned installation is completed it will be the largest hydro-electric station in Great Britain (120,000 h.p.).

The Ross-shire Co. has 1,200 kW installed at Loch Luichart, while the Walkerburn plant in Peebles-shire, which produces 160 kW under a head of 11 ft., is the only one in Great Britain utilising mechanical storage of power. Normally the electricity produced drives a mill for about 50 hours per week, and at other times it is used to pump water into a reservoir 1,050 ft. above the power house. The stored water is used to augment production through the medium of a 155-kW Pelton wheel generator.

The Galloway Co.'s scheme involves the construction of five separate stations, of which two (21,000 kW at Glenlee and 36,000 kW at Tongland) are now under construction. The scheme is to be completed in August, 1936 (102,000 kW); all the stations have been "selected" and the estimated output of 182 million kWh per annum is to be purchased by the Central Electricity Board.

The Grampian Co. has 32,000 kW at Rannoch and 34,000 kW at Tummel. The connected load is 25,000 kW and the maximum demand is 6/7,000 kW. It was originally intended to supply the Fife Co. and the Scottish Central Co., but since these companies' stations were "selected" 24,000 kW has been supplied instead to the Central Electricity Board.

For the two pipe lines at Loch Ericht five anchorages are provided, but instead of supporting the pipes on concrete pedestals each is carried on intermediate roller supports. It was thus made possible to effect considerable economy in respect of anchorages owing to the reduced volume of concrete needed. So far two vertical Francis turbines have been installed enclosed in spiral casings, to work under a net head of 575 ft. down to 396 ft.

The vertical alternators are rated at 20,000 kVA at 500 r.p.m., 11,000 V, 50 cycles, three phase. The main switchgear is of the cellular type. A third winding in the 11/33-kV step-up transformers provides a supply at 2,200 V for external distribution to areas adjacent to the power station. It also energises the station transformers which step down to 440/250 V for the supply of electricity for auxiliary services.

At Loch Rannoch the duplicate pipe line is supported on roller bearings with three anchor blocks. The two Francis turbines are horizontal with double runners and twin spiral casings, but single discharges. The normal speed is 300 r.p.m. with a head of 160 ft. The horizontal alternators deliver 21,250 kVA at 11,000 V, 50 cycles, three phase. The primary switchgear is of the cellular type and the secondary gear of the steel cubicle pattern. Besides the 11/132-kV step-up transformers, there are 11/33-kV step-up distribution transformers, the tertiary windings of which furnish the 440/250-V station auxiliary supply.

The paper includes descriptions of the step-up and switching sub-stations, transmission lines, methods of load control and protection, and the communication systems employed; the last-named include radio-telephony by means of high-frequency carrier waves imposed on and tapped off the main 132-kV power transmission overhead lines through the medium of condensers.

First Principles

ACCORDING to custom, the president, Dr. W. M. Thornton, opened the first informal meeting of the 1934-35 session of the INSTITUTION OF ELECTRICAL ENGINEERS in London on October 29th.

First principles, said the president, were attempts to state the results of observation in as simple a form as possible. The history of science was little more than a record of the constant attempt to fit new facts into such a simple code, and there were really few principles, other than the formal logic of mathematics, that had not to be adjusted from time to time to meet new conditions.

How many times had a practising engineer to fall back on first principles for a solution of his difficulties, and what were his first principles anyway? Were there not still more fundamental things that he had no occasion to use, or even to know? Insulation was an example of where a lack of knowledge of fundamentals was even now a direct hindrance to the progress of the profession, and it was perhaps the most outstanding example that could be given.

It was remarkable how well small steady or low-frequency currents were transmitted by sea water for many miles. Why was it that a galvanometer connected to a sea plate flickered regularly from side to side three or four times a second when a steamer passed some miles away, indicating that a low-frequency current was generated by the ship? Each blade of the propeller as it revolved cut through a fresh body of water and repelled it. Now sea water was an electrical conductor and each movement of a body of sea water through the earth's magnetic field set up a current so that there was from the propeller a current corresponding to the frequency with which the blades passed through the line of travel. The currents flowed at right angles to the line of motion and spread out for miles—at least they could be picked up miles away. The same applied to fish and to breaking waves. The great swing of the tides in the ocean had a similar effect. Across the Atlantic there was about 20,000 A at the maximum tide flow and in the surface layers.

How did a match light a gas jet? Not by the conduction of heat from the flame to the gas, but by the electro-magnetic radiation from it. Radiation from the spirals activated the air and gas between them much more efficiently than a straight wire could do. This was at the back of the efficiency of the new coiled lamp filaments, and was also the reason why the latest pulverised fuel combustion chambers for boilers were so designed that the entering air and fuel were exposed as fully as possible to radiation from both the gas and the walls.

These were examples of how a knowledge of first principles operated in practice, but there was another side to the question. What was wanted quite early in all scientific training was to indicate that there were great sweeping laws that gathered together masses of apparently disconnected facts like fish into a net. Students should be told, if possible, what those laws were and meant and then let them acquire facts and fit them into place, rather than give them masses of facts in the first place, necessitating a considerable waste of time, to sort out later in life.

Submarine Propulsion

OUTLINING progress in naval construction in the Andrew Laing lecture, delivered before the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS at Newcastle-on-Tyne on Nov. 2nd, Sir Arthur W. Johns, Director of Naval Construction, stated that Great Britain decided to acquire submarines for trial in 1900.

The first vessels were built by Messrs. Vickers in agreement with the Holland Torpedo Boat Co. (later the Electric Boat Co.) of America. The first had a surface displacement of 660 tons (810 when submerged) and was of 160 b.h.p. (75) with a speed of 7.4 knots (5).

Since the War the British Navy had built fast patrol submarines of the *Thames* class with a displacement of 1,805 tons (2,680) of 10,000 b.h.p. (2,500) and a speed of 21.75 knots (10). While steam turbines had been tried, ordinarily internal-combustion engines were used for surface propulsion with battery-driven motors for submerged propulsion. Weight per b.h.p. had decreased slightly, but speeds had remained practically the same as during the War.

An increase of under-water speed was difficult to obtain with the present accumulators and motors. The weight of the battery alone was of the order of 200 lb. per b.h.p. developed by the motors, and, although attempts had been made to reduce this figure and also the space occupied in the submarine, there had been little progress in this direction.

Welding

Both oxy-acetylene and electric welding had been used before 1914 for minor work in ships, but the abnormal increase in ship repair during the War resulted in appreciable advances in both the production of machines for electric arc and resistance welding and also in the manufacture of electrodes.

In 1917-18 two important and comprehensive tests were carried out, one by the Admiralty at Portsmouth and the other at Messrs. Cammell Laird's, under the supervision of Lloyd's Register of Shipping, which as a result of these tests issued its first tentative regulations for the application of electric welding to ship construction. On June 11th, 1918, a 250-ton barge for cross-Channel service was launched at Richborough. She was the first all-welded vessel built in this country, the work having been carried out under the supervision of the Admiralty Department for Auxiliary Shipping. In 1920 the *Fullagar*, an all-welded ship of about 850 tons, was built by Messrs. Cammell Laird, and in one collision, although she sustained appreciable damage, the welding remained intact. In 1933 a 1,620-ton barge, *Peter G. Campbell*, was built by Messrs. Swan & Hunter in the record time of ten weeks, and on completion was towed across the Atlantic, encountering heavy weather, the welded joints remaining intact and entirely satisfactory, despite the heavy buffeting to which the vessel was subjected.

During the past four or five years the use of welding has been gradually extended in the construction of British warships. Sir Arthur had found builders eager to train the personnel for the newer method of connection. His colleague, Sir Percy Addison, Director of Dockyards, had placed the experience of the yards at the disposal of firms, and the representatives of several had taken advantage of this offer.

Coal-getting by Machinery

WITHIN the last fifty years no branch of engineering had undergone such conspicuous development in technique as coal mining, said Sir Richard A. S. Redmayne in his presidential address to the INSTITUTION OF CIVIL ENGINEERS in London on Nov. 7th.

Reference was made to the great progress witnessed in every direction, except in respect of the return on capital, wages having increased enormously and hours of work been reduced, through the greater application of scientific principles in the art of coal mining. The rapid advance in the use of machinery below ground was possibly the most significant of all post-war developments, intensive machine-mining having been so widely adopted in Great Britain that there were now many collieries in which the only manual labour employed in the actual process of coal getting was that of shovelling the machine-cut coal at the coal-face on to a band or jig conveyor.

The mechanical cutting of coal received considerable attention in the address, and comparisons showed that whereas in 1900 only 1.47 per cent. of the coal raised in Great Britain was machine-mined, in the United States 24.9 per cent. was so mined; by 1932 the figures were 38 and 68.3 per cent. respectively. In the United States, however, the natural conditions were better suited to the application of mechanical undercutting of coal than in some of the British coalfields.

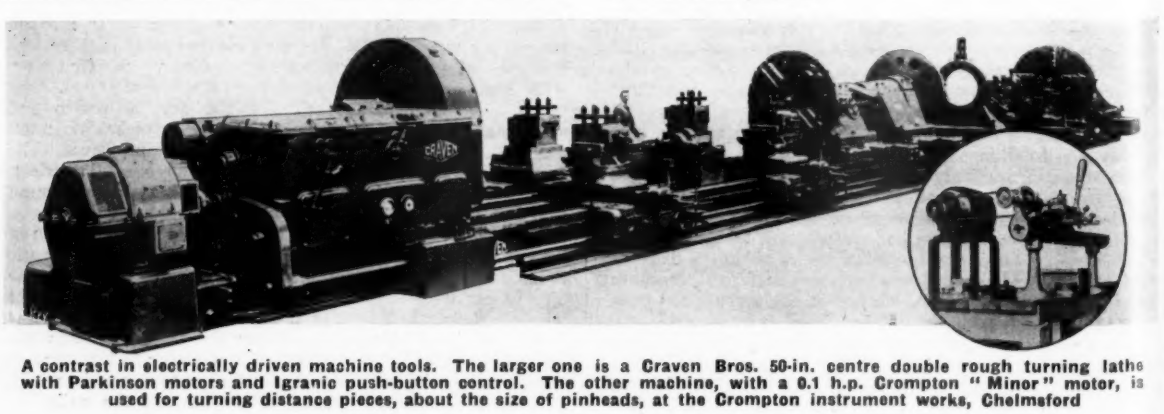
Such questions as the greater employment of electrical power in coal mines and developments in the cleaning of coal were also considered. Sir Richard said that much had been done towards the limitation of the effects of colliery explosions, and it was not too much to hope that in the not distant future their prevention would be made absolute. Such prevention was largely a matter of the due observance of well-established precautions.

The world-wide decline in export of coal was attributable to two factors, one of a temporary character, namely, the depression in industry generally, and the other the increasing use of substitutes, such as oil and water-power. The potentialities of those rivals were examined, with a result not unfavourable to coal.

* * *

Physical Society Papers

Among the papers submitted to the PHYSICAL SOCIETY in London on Nov. 2nd was one by Mr. E. W. Benham on the electronic theory and the magnetron oscillator which extends the author's previous analysis to cover any degree of space charge limitation. In addition to terms involving initial velocities and accelerations of electrons, the effect of a magnetic field of constant value has been included. The absolute measurement of electrical resistance by a new rotating coil method which is very sensitive is described in a paper by Dr. H. R. Nettleton and Mr. E. G. Balls. The experimental work is mainly devoted to a study of the laws of inductance on which the method depends and to the determination of constants. Owing to the relatively large e.m.f.'s involved, the method is very sensitive and a fluxmeter can be used as the balance detector for hand-controlled stroboscopic pins. In other experiments a synchronised television motor is used. The propagation of medium radio waves in the ionosphere is the subject of a paper by Dr. D. F. Martyn, who shows how the non-fading radii of broadcasting emitters over country of any effective conductivity may be determined. A paper by Dr. D. F. Martyn, Mr. R. O. Cherry, and Dr. A. L. Green deals with long-distance observations of radio waves of medium frequencies.



A contrast in electrically driven machine tools. The larger one is a Craven Bros. 50-in. centre double rough turning lathe with Parkinson motors and Igranic push-button control. The other machine, with a 0.1 h.p. Crompton "Minor" motor, is used for turning distance pieces, about the size of pinheads, at the Crompton instrument works, Chelmsford

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

A Handy Automatic Cable Grip

There is one point that should not be overlooked in connection with the cable grip described by "Cable Man" in your issue of October 12th (page 476). It is, that the grip suggested will put a very considerable crushing pressure on the sides of the cable. With the design shown, this will amount to about seven times the pulling stress. A pull on the rope of only 3 cwt. will therefore exert a pressure of about one ton on an 8-in. length of cable.

Double eye split "basket" grips are obtainable, which can readily be laced on to any point along the cable, whereas the grip suggested, if made as described, has to be slipped on from one end. "Basket" wire grips put a uniform pressure on the whole circumference of the cable, and owing to their length, distribute the grip over a very much greater area.

October 30th. H. G. W.

Selling Electrical Goods

As an outside sales representative in the electrical industry, of which I am justly proud, I wish to point out to the writer who calls himself "Victim" that his views on selling and what go to make a salesman are somewhat limited—evidently from his own experience only according to the strain of his letter.

In the first instance, you cannot take a storekeeper or counter-salesman, dress him up and call him a salesman, because he would not have specialised knowledge of the products or points of competitive sales talk, due to lack of training. There is also a vast difference in selling to "prospects" who have called into a shop and are therefore already 50 per cent. sold, than creating prospects by canvassing and showing the need of your product, then changing that "need" into "want." To do this one has to be trained in salesmanship. For instance, would "Victim" be a willing fare in a taxi driven by a man whom he knew had never driven anything else but a tram? Both are classed as drivers, but what a difference!

However, I would suggest in conclusion, that your correspondent should analyse himself and his knowledge of the product that he wishes to sell, and then set about to create a position for himself. It can be done; I can assure him of that.

REVIEW READER.

October 31st.

Electric or Diesel?

In his letter under the above title (should this not, by the way, be "Electric or Diesel-electric"?) Mr. A. R. Nissar states that the performance of the oil-electric M1001 "is a challenge to its rival, the electric locomotive, which the electrical engineer cannot lightly ignore." I hope that the electrical engineer, who so often displays an affection for oil as a substitute for his own commodity, will not lightly assume that M1001 has put straight electric traction in the background.

The exceptionally high speed attained by M1001 is not due to any unique characteristic of the oil engine. It is really a triumph for streamlining. At speeds in the neighbourhood of 100 miles per hour air resistance accounts for about 80 per cent. of the power.

In order to get a clear idea of the relations between an oil-electric and an electric locomotive, it is important to remember that the actual drive is similar in both cases and that the main difference lies in the source of power. The oil-electric locomotive carries its own generating plant and is therefore restricted in its energy output to the capacity of that plant. The electric locomotive, on the other hand, can draw upon the virtually unlimited energy of the central supply.

That being so, it is clear that extra high speeds can be more readily attained, especially with heavy loads and on up grades, with an electric locomotive than with a self-contained locomotive. The question for the railways is whether such high speeds are economically justified, in view of the running costs and the increase in maintenance and depreciation. The trial run of the M1001 may yield figures for fuel and lubricating costs, but we know nothing yet of the other items in the account.

If the depreciation and maintenance costs on the locomotive and track do not prove excessive, high speed oil-electric trains may serve as traffic builders on certain long-distance routes with light traffic, just as oil-electric railcars serve on lightly loaded branch lines. The situation is quite different, however, on our railway network, where the traffic is denser and where the traffic manager has to co-ordinate express, inter-urban and goods services. For passenger traffic, electrification has the advantage when the traffic is dense enough to justify the capital cost of the power distribution equipment. For goods traffic, the oil-electric locomotive, owing to its power limitations, is unsuitable, except perhaps in shunting yards, whereas electric traction offers a speedier service which is much more easily dovetailed into the passenger service.

The performance of the M1001, therefore, will not, even if it should survive the test of time, invalidate in any respect the case for railway electrification. PROTONIUS.

November 5th.

The I.E.E. Regulations

With reference to the correspondence in your columns concerning earth leakage, and more particularly to Messrs. Everett Edgcumbe's letter on page 610 of your issue of November 2nd, it seems to me that the question to decide is what voltage rise above earth is permissible; and one wonders why the new Regulations do not precisely state a voltage.

Messrs. Everett Edgcumbe point out that under certain conditions the voltage will rise to over 100 above earth, and go on to say: "It is evident that it is precisely for this reason that the I.E.E. Regulations stipulate that the current causing the trip device to operate shall not exceed 30 mA, since the voltage drop, &c.," and proceed to show that with a 500-ohm earth resistance and 500-ohm impedance the voltage rise would be 30 to operate a 30-mA relay. The figure of 30 V is simply the result of using a value of impedance to suit their relay, and is not a deduction from the Regulations.

The Wiring Rules Committee certainly had no such voltage limit as 30 in mind when framing Rule No. 116, because as it allows a 1-ohm earth and 100-A leakage, the voltage is 100, so one is entitled to assume that the Committee had the same value in mind for Rule No. 1005c, that is, a 30-mA earth leakage trip operating at 100 V above earth. But why these ambiguities in the Regulations? Will the Institution set up a standing committee (chairs advisable) to deal with them?

Referring to Messrs. Everett, Edgcumbe's diagram, I consider that the relay should not close the circuit of a trip coil, because other faults in the line would not be detected in advance. The relay made by my firm to meet the Regulations also operates within 15 V, 30 mA, or 30 V, allowing for 500-ohm earth, and is arranged to *break* the no-volt trip of a standard circuit-breaker. The system being self-checking, any faults in the circuit are discovered in advance of the critical moment. J. W. RECORD.

Record Electrical Co., Ltd.

Manchester, *November 5th.*

In responding to my letter of October 26th, Mr. T. C. Gilbert and Messrs. Everett, Edgcumbe & Co., Ltd., deal with methods of actuating a switch by the effect of a leakage current. I do not advocate any one particular method of leakage trip actuation because operating conditions alone decide requirements. I am not concerned with the manufacture of apparatus but only with experimental work.

I mentioned an experimental switch which, though entirely suitable for the particular operating requirements, did not comply with the I.E.E. Regulations, and if modified to do so would become much less suitable for its purpose. My letter invited an exchange of views upon the amendments required if the use of the most efficient apparatus is not to be prohibited simply because the Regulations have omitted to make provision for it. Reference was made to a short-break a.c. switch that cannot break a small direct current. Regulation 1332 requires a d.c. test to be applied to an a.c. switch and therefore opposes the short-break switch; the latter should be exempted from the requirement that it shall break d.c.

Inadequate provision is made for operating conditions between Regulation 1005 and Regulation 116; *viz.*, the pivotal consideration is whether or not an earth resistance exceeds 1 ohm. Should the earth resistance exceed 1 ohm a leakage switch must be actuated with not more than 30 mA, but if the earth resistance is 1 ohm or less it is assumed to be suitable for an earth leakage up to 100 A, when Regulation 116 applies. Between the limits of 100 A and 30 mA are the d.p. services up to 60 A, many of which are for domestic load. The medium for earthing the domestic installation is the water service pipe which is apparently assumed to be suitable for a leakage current up to 100 A, since nothing is stated about limitation of maximum leakage current.

As an example of the unsuitability of the domestic water pipe, an earth fault on a cooker protected by 30-A fuses and earthed to a water pipe caused a fire in a house several doors away. The fault caused a potential rise on the water pipe which made contact with a gas pipe at the distant house. The limit to the fault current capacity of the average domestic

water service pipe is considerably less than 100 A, and its limitation to a safe value requires a leakage actuated switch, but with a type of trip differing from that required when earth resistance is moderate or high.

In the experimental switch mentioned in my previous letter, a 15-A thermal element was used when a water pipe was available to retain the main switch in the " on " position. The earth connection between the cooker and water pipe was made through the thermal trip which operated only if the local circuit fuses failed to prevent more than 15 A leakage to the water pipe, which may be carrying a fault current from another service connected to a different phase.

A wax thermal release consists of a heat-coil spring embedded in a wax substance of high melting point. The wax when solid grips the convolutions of the spring, which controls the retaining catch device of a switch having a spring bias tending to open the circuit. The heat-coil spring, unless reinforced by the solid wax, cannot resist movement of the retaining catch which has a pressure applied to it due to the switch tending to return to the " off " position. If the heat coil is connected between conduit and earth a leakage current will soften the wax until the switch is released, when the pressure is removed from the retaining catch and the heat coil, the latter contracting before the wax hardens. The switch can then be reclosed. It can be tripped with less than 1 W and has an inverse time lag. A severe overload will cause the heat coil to become red hot, when no wax can restrain it. The melted wax protects the spring from fusing and corrosion.

These characteristics were required by a supply authority to control the supply at the service, and the switch was not for the protection of the consumer's circuits, which would still require fast operating leakage switches with portable appliances. Such leakage switches might trip the main switch unless the latter had a time-lag device. The wax thermostat was intended to limit the potential rise on the general conduit system and was connected between the latter and some buried pipes which had a resistance of less than 10 ohms. A 10-V rise on the conduit system would trip the service switch, but a sudden " dead earth " on the conduit system would trip the wax switch in a fraction of a second, because the total leakage current would pass through the heat coil.

The direct-tripping energy value I gave at 1.5 W, requiring a 50-V potential rise between conduit and earth if 30 mA is needed to operate the trip. I have one of the German switches mentioned in Mr. Gilbert's article in the ELECTRICAL REVIEW of October 5th last. This switch will trip with 24 V when in series with an earth resistance of 200 ohms and with 42 V when the earth resistance is 500 ohms; these figures are as given by Mr. Gilbert. An increase of earth resistance from 200 to 500 ohms requires a voltage increase (24 V to 42 V) of 18 V; the current therefore is 60 mA. Of the applied 42 V the 500 ohms earth resistance requires 30 V so the switch trip operates with 12 V 60 mA or 0.72 W. If the current were limited to 30 mA the actuating voltage would be 24. To allow 1.5 W to trip a 50-A switch is reasonable, so it is possible for the voltage between conduit system and earth to reach 5 before tripping. Messrs. Everett, Edgcumbe confirm my figure of 1.5 W.

From the energy expenditure figures given by Mr. Gilbert of 0.3 W for a four-pole 200-A switch and 0.1 W for a 30-A switch, it would appear that any mechanism responsive to such slight actuating energy would be equally responsive to slight vibration.

Should a relay be actuated by a leakage current, very much less energy than 1 W would be required; but if the relay controls a circuit which applies power to the trip mechanism, then the total actuating energy is considerably more than the relay energy; so actuating the relay does not necessarily mean tripping the switch. If the arrangement illustrated by Messrs. Everett, Edgcumbe, in which a relay controls the circuit to a volt release for the circuit-breaker, is applied to a d.p. service the neutral fuse may be the only one to blow on short circuit.

Should an earth follow the short circuit then the relay would be actuated by the fault current from the phase fuse in circuit, but as the volt-release coil of the circuit-breaker is not energised, the conduit system may remain alive at full line potential above earth. When earth resistance is high, the relay arrangement of Messrs. Everett, Edgcumbe would be necessary, but in many instances it would be preferable if the circuit-breaker were tripped by a no-volt coil controlled by the relay.

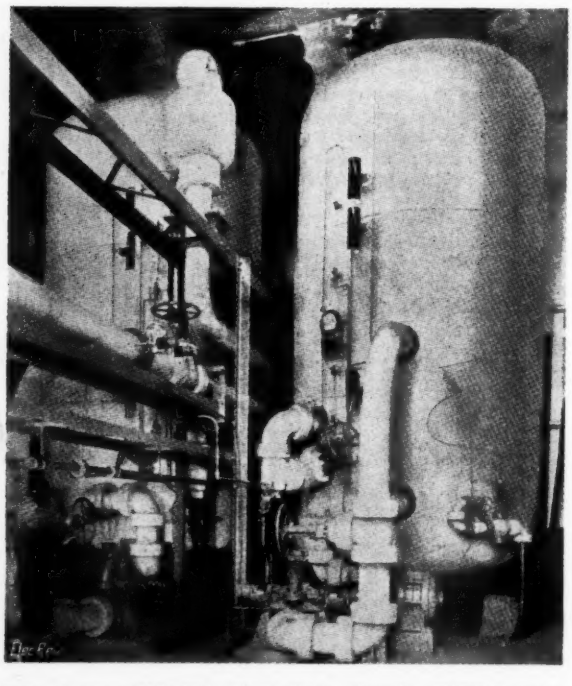
A. G. BULLEN.

Liverpool, *November 5th.*

Electricity Supply in Ontario

THE twenty-sixth annual report of the Hydro-Electric Power Commission of Ontario for the twelve months ended October 31st, 1933, is a 500-page document covering the Commission's operations in areas served by its thirty-nine hydro-electric schemes, those of 757 municipalities.

The Abitibi Canyon station was the chief constructional work completed during the period. The two units put into commission (aggregating 55,000 h.p.) dealt with a load of 45,389 h.p. and had an output of 31 million kWh. This work was done by the Commission for the Provincial Government.



Two of three 30,000-kW, three-phase, 50-cycle, 66,000-V steam generators for the Ontario Paper Co.; maximum operating pressure 200-lb. per sq. in.

Transformer stations were built for supplying off-peak power to electric boilers, aggregating 122,000 kW, for generating process steam in three paper mills. Further similar installations are under consideration. A water-heater campaign has resulted in the development of better apparatus than was previously available. Heaters are installed without cost to the consumer, but even at the low rates the revenue obtained is usually enough to defray the expenditure within a year.

The rates charged by the municipalities served from the hydro-electric system are controlled by the Commission. For domestic consumers the tariff is a service charge of 33 cents per month up to 2,000 W connected and 66 cents if above, and a running charge of 1 to 9 cents per kWh (varying in different towns) for a consumption of from 30 to 60 kWh per month, and from 0.5 to 5 cents per kWh for all above. For commercial lighting the service charge is from 5 to 7.5 cents per 100 W, the first step of the running charge 2 to 9 cents per kWh for the first 100 hr. per month, and 0.5 to 2 cents for all above.

The tariffs for industrial power have as their basis a monthly use of m.d. of 130 hr. for which from $17 to $69 is charged in different towns; the service charge per h.p. per month is $1 and the kWh rates 1.3 to 9.3 cents for the first 50 hr. per month, 1 to 4.8 cents for the second 50 hr., and 0.1 to 1.0 cent for all additional kWh. A discount of 10 per cent. for prompt payment is allowed on all tariffs.

The maximum monthly consumption per domestic consumer was 176 at Niagara-on-the-Lake, the population of which is under 1,700. The demand (Canadian loads only) in December, 1933, was 1,440,000 h.p., an increase of 402,000 over the previous December, due chiefly to the sale of secondary power. The total investment of the Commission in power undertakings and hydro-electric railways is $235 million, exclusive of Government grants for rural lines and the expenditure by municipalities on distribution systems, which amounted to $110 million. The revenue reached $28 million, and expenditure (including capital charges) $32 million, the difference being appropriated from obsolescence and contingencies reserves.

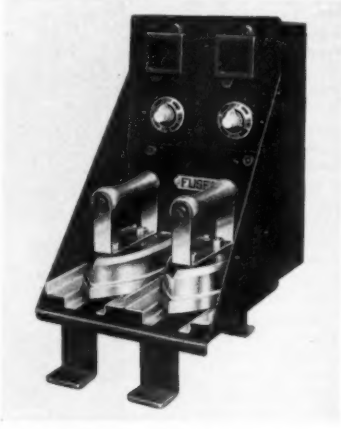
Nearly all rural service is given in districts directly operated by the Commission. Of the $17.7 million invested in these systems, half is borne by the Ontario Government. A total of 9,244 miles of transmission lines has been constructed (of which 326 miles were erected during the year), supplying about 62,000 consumers. More than 21,000 rural consumers in twenty-three power districts are charged a primary rate of 3 cents or less per kWh, in most cases with a follow-up rate of 1.5 cents or less per kWh.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Cordless Irons

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has introduced a useful addition to its range of electrical laundry equipment in the form of cordless laundry and tailoring irons. The apparatus has been specially designed to meet the objections which have been raised by certain operators who, having become accustomed to the handling of gas or fuel-heated irons, find some difficulty in adapting themselves to the ready manipulation of the standard type of electric iron fitted with a length of flexible.



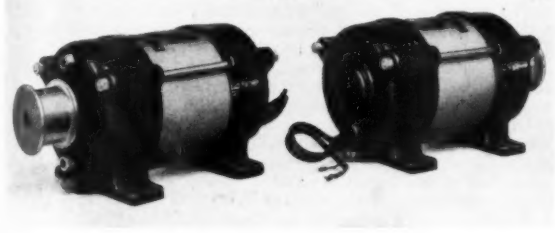
The " Magnet " cordless iron system

In this new system each operator is supplied with two irons, one of which is in use, while the other is being heated up by being plugged into a board of the type illustrated. When the temperature of the iron in use falls below a satisfactory working degree the irons are changed over.

The illustration shows a two-way board, complete with two 7½-lb. irons for laundry use. The board is fitted with switches, fuses, and also pilot light holders to indicate when the electric current is " on."

Relay for the Rapid Stopping of Machinery

For the control of electrically driven machines the standard modern practice is to use contactor-type starters operated by push-buttons, usually with squirrel-cage motors. In many cases, such as high-speed wood-working machinery, a simple device for stopping the machine quickly saves time during the " setting up " period, and also increases the safety of the operator. For example, a high-speed planer cutter may take



The B.T.H. reverse-rotation relay

four or five minutes to come to rest after the current is switched off, whereas it is claimed for the reverse-rotation relay introduced by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, that the stopping time need be only a few seconds.

The motor is started by a contactor in the usual way, and when quick stopping is desired a " plugging " contactor is energised which reverses the phases of the motor. The relay ensures that the motor will not run up in the reverse direction, since the " plugging " contactor is de-energised when the machine speed has fallen to a predetermined value. The relay is a centrifugal device, much like a miniature generator in appearance, which is driven from the motor or machine by a belt or simple coupling, so that the normal relay speed is from 1,500 to 2,000 r.p.m.

The rotating portion of the relay runs in magneto-type ball bearings. All contacts are designed to give a wiping action to overcome any tendency to pitting. A three-way control, with push-buttons marked " start," " stop," and " plug-stop," is employed.

" Self-regulating " Soil-heating Cable

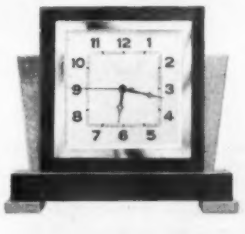
The " self-regulating " soil-heating cable recently introduced by SUN-VIC CONTROLS, LTD., 430-431, Bush House, Aldwych, W.C.2, maintains a steady hot-bed temperature automatically by virtue of a specially designed thermostat embodied within the cable sheath. The cable is supplied in complete lengths of 10 yards, sufficient to maintain a hot-bed temperature in a 6 ft. by 4 ft. frame.

The frame is prepared by laying down a bed of coke or ash, which is best extended around the walls of the frame. This conserves heat and so reduces the electricity consumption. The coke bed is topped with a two-inch layer of sand, in which the cable is laid in a zig-zag fashion, the cable ends being connected to a source of supply. Soil is filled in to the required depth, and the hot-bed is then ready for use. To prevent possible damage to the cable when digging it is best to lay a mesh of wire netting between the sand layer and the soil. With this protection the lead-covered and taped cable should last many seasons without any attention whatever.

Three types of cable are available for raising a 4 ft. by 6 ft. hot-bed to 50, 60 and 70 deg. F., respectively. The lowest temperature cable affords adequate protection against frost, and its consumption is about 2 kWh per day. The cable, which is equally suitable for heating the air inside the frame, is manufactured for the Sun-Vic company by Messrs. Siemens Bros. & Co., Ltd., Woolwich, S.E.18, the specially designed thermostat being a " Sun-Vic " production. A 30-ft. length of cable costs 25s.

A New Range of Electric Clocks

THE EUSTON MANUFACTURING CO., LTD., 143b, Euston Road, London, N.W., is manufacturing a range of domestic electric clocks. They have coloured bakelite cases and are available with both angular or stepped side pieces. The side pieces and feet are usually in contrasting colours. A large range of colour combinations is available—the body can be obtained in black, mahogany, old ivory, and the side pieces in green, orange, red, etc. Measurements are 8½ in. by 7¼ in. high and 6 ft. of silk flex and adaptor are included in the price of 40s.



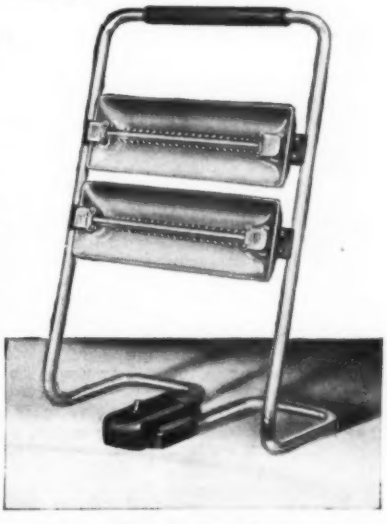
A new " Euston " clock

The fumed oak clocks with chromed figures (model 120), suitable for dining rooms and libraries are made in several sizes; the illustration represents a 12 in. dial clock (67s. 6d.). The square type can be built into existing furniture and can be obtained with a chromed surround. Fumed oak, Chippendale, mahogany or figured walnut finishes are available.

Model 121 is made for standing on the mantelshelf or a similar position. It has an 8½ in. dial and is priced at 55s. The same woods and finishes are obtainable. The round clock, Model 3, is in bakelite and designed for halls, offices and industrial use; it is supplied with 9 and 12 in. dials, prices at 47s. 6d. and 65s. The bakelite hexagon clock (Model 4) costs 55s. with an 8 in. dial.

Inventum Fires

Among the new fires to be introduced by INVENTUM ELECTRICAL APPLIANCES, LTD., Wembley Park, Middlesex, is a chromium plated steel tubular model (No. 1,023) priced at £2 10s. It has a loading of 500 or 700 W on each of the two elements, which are controlled by a switch at the base. The elements are of the plug-in type and are backed by parabolic chromium-plated reflectors. The top horizontal bar is heat-insulated in order to provide a suitable carrying handle.



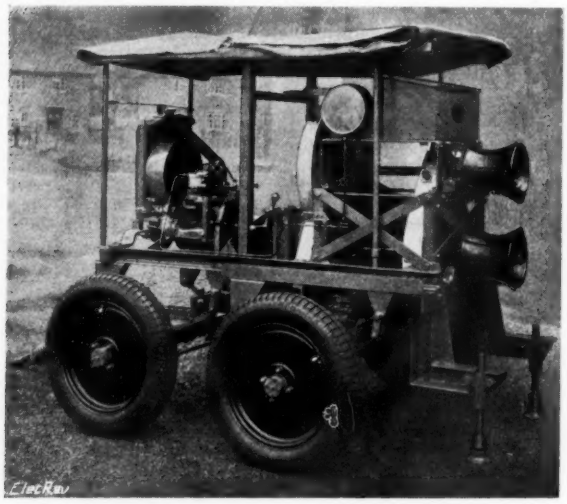
The Inventum No. 1,023 fire

A Cable-hauling Winch

A new design of power-driven cable winch, of the type used by the General Post Office and its cable-laying contractors, has been introduced by MESSRS. LACY-HULBERT & CO., LTD. The winch is claimed to be capable of hauling the heaviest cable at the maximum speed allowed. It has high- and low-speed bollards driven by a four-cylinder 8-h.p. Ford engine through epicyclic gearing and clutch with hand control for adjusting the pull on the cable. The engine is fitted with a speed governor, radiator and fan, impulse magneto and

silencer. The coupling between the engine and winch is of the Hardy disc type.

The set is spring-mounted and is provided with Ackerman steering with expanding brakes on the rear wheels, which are automatically operated from the hauling vehicle. Two jacks at each end take the load off the tyres (Dunlop 28 in.



The Lacy-Hulbert cable-hauling winch

by 5 in.) and secure stability under working conditions. Included in the equipment is a tool box and a water-proof canopy with side curtains. The weight, complete, is about 30 cwt.

A Glass "Coolicon"

The Benjamin "Coolicon" has made an appearance in a new form, namely, with a glass shade. It is suitable for use with a standard b.c. brass or bakelite lampholder, and the finish is white. Two sizes are available, one, 9 in. in diameter for 40 to 75 W lamps, and a second, 11 in. in diameter, for 100 to 150 W lamps, the list prices of these two sizes being 2s. 9d. and 3s. 3d. respectively. The overall efficiency of this shade is claimed by the manufacturers, BENJAMIN ELECTRIC, LTD., Brantwood Works, Tottenham, N.17, to be 85 per cent.

The Glass "Coolicon"

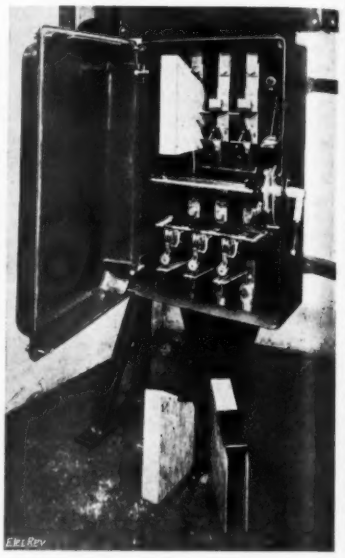
A Car Engine Heater

The Bray electric car engine heater consists of an element screwed into a container, which is provided with inlet and outlet pipes for fitting into the circulating system. The container is designed to give an unrestricted flow of water. A connector for plugging into the element is fitted with a scraping earth which engages with the metal cover. The element is made by introducing into a tube a porcelain core upon which an 80-20 nickel-chrome resistor is wound, and then firmly embedding it in a refractory material by a special process. Only a thin layer of refractory material separates the helix from the case so as to keep the temperature difference between the resistor and the case as small as possible. Oxidation of the helix is reduced to a minimum, due to the very small area of the element exposed to the atmosphere. The element is fired in order to mature the refractory, and each element is subsequently tested to withstand a breakdown voltage between the terminals and the case of 1,500 V. Prices range from 25s. to 30s., the 150 W size being recommended for cars up to 16 h.p., 250 W for 17 to 30 h.p., and 350 W for larger cars, buses and lorries. The makers are MESSRS. GEO. BRAY & CO., LTD., Leeds.

The Bray car engine heater in position, and a sectional view

Automatic Air-break Switch

Modifications have been made in the construction of the "HH Type" distribution gear manufactured by MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, for use where atmospheric conditions are bad. These include an improved method of clamping the bus-bars and a more economical method of providing for neutral connections when required. The automatic air-break switch for 660 V a.c. or 500 V d.c. designed for incorporation in the "HH" gear (it may also be used as a separate unit) has standard current ratings of 30, 60, 100, 200 and 350 A, but 600-A and 1,000-A models are also available. Adjustable combined thermal and magnetic trips or over-current trip-coils with or without time-limit dash-pots are fitted. Under-voltage releases can be provided.



The Reyrolle 350 A, 600-V, three-phase automatic air-break switch, with thermal protection—one arc-chute only in position

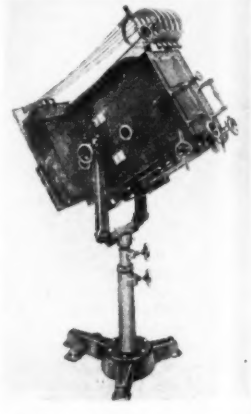
Heat Insulation

Owing to a printer's error the upper temperature of one grade of "Thermolag" was given in our last issue as 250 deg. F. Actually it is 350 deg. F.

A Magazine Projector

The new Beard magazine projector, type "R.B.650," has a body constructed of sheet steel with a cast back and bottom. It consists of an inner and outer casing with an intervening space which allows free air circulation. Sheet asbestos is used as an interior lining, and an inspection door and two sight holes are provided on each side of the housing. Two lenses are fitted and vertical and horizontal shutters are provided.

The arc lamp is of heavy construction and is fitted with six movements. It is capable of carrying 80 A, and is focused mechanically by a hand wheel on each side of the lamphouse, a seal being fitted over each handle, enabling the arc to be set for any given size "Spot." The makers are MESSRS. R. R. BEARD, LTD., 10, Trafalgar Road, Old Kent Road, London, S.E.13.



The "R.B.650" projector

A New Bulpitt Kettle

We are informed that the "Swan" quick-heat kettle which was described in our issue of October 19th (page 520), has now been superseded by a new model with the same boiling speed, *i.e.*, three pints in five minutes. The element is similar in shape to the standard element but has a greater heating area, as shown in the accompanying illustration. This kettle is made by MESSRS. BULPITT & SONS, LTD., Swansea Works, Birmingham.

The new "Swan" quick-heat kettle

New Books

Electron Tubes in Industry. By K. HENNEY. London: McGraw-Hill Publishing Co. Pp. 490; illus. Price 30s.

The development of thermionic and light-sensitive valves (or "tubes," as they are called in America) has been so closely associated with the recording and reproduction of sound that it is not surprising that many engineers in different industries should be unaware of the multitude of industrial applications of their respective principles. This book gives a clear survey of a relatively new field, from a strictly American point of view.

The first part deals with the vacuum valve as amplifier, a function in which it is irreplaceable for exact and minute measurements. The second part develops the subject of the industrial use of the less familiar gasfilled triodes, capable of handling a considerable flow of current. One twelve-anode type is mentioned as carrying on each anode 4,000 A at a d.c. voltage of 1,500. Amongst the many extremely interesting applications described are a method of spot welding control that would seem to have important possibilities, and the inversion of d.c.

The author looks forward to a time when a.c. will be generated and rectified at source, distributed in bulk as d.c., and inverted for final distribution to the consumer. The idea is not an easy one to accept, and the means are not yet provided, but meanwhile the valve-operated invertor is with us, on a small scale, and offers immense advantages over the rotary convertor. The last part of the book deals with the photo-cell, and some particularly valuable pages are devoted to photometry and colour-matching. In the multitude of examples given, it seems strange not to find timing controls for greyhound and other racing which have proved so valuable on this side of the Atlantic.

Nearly every application is illustrated with a circuit diagram, to which most English readers will have to refer constantly to judge of the characteristics of American valves, whose strange names the author assumes to be familiar to his readers. The English publishers would greatly enhance the value of this book here if they gave a table of the approximately equivalent British valves where such exist. The sources are mainly American, and the index, though valuable, is far from complete. There is no exact counterpart to this volume in this country, and it should prove an excellent stimulant to fresh ideas and applications in this field.

Logarithms—Numerical and Graphical. By N. R. CORKE. Pp. 79; figs. 39. London: Gee & Co. (Publishers), Ltd. Price 8s. 6d.

John Napier in 1614 devised a system of logarithms because he found the arithmetical part of his everyday calculations tedious and liable to error. The author of this book has been incited by the same considerations to produce a handbook to the art of calculation by this method.

The practical use of logarithms is not nearly so widespread as it should be (which is surprising, considering the ease with which a working knowledge of them can be acquired), while tables of cologarithms and log-logs present unknown territory to most. The explanations given here are simple and to the point, the chapter on plotting and calculating on log paper being particularly useful in its application of the method to the keeping of statistics.

The sections on slide-rule calculations and nomograms are also likely to be useful. The book is intended for self-study, and, while much of it is elementary, it contains enough matter of a character to appeal to those with a more advanced mathematical knowledge.

Die Elektrischen Maschinen. (Vol. III: Berechnung und Bemessung.) By DR.-ING. M. LIWSCHITZ and DR.-ING. H. RAYMUND. Pp. 409; figs. 307. Leipzig: Verlag B.G. Teubner. Price: RM.22.50.

This is the concluding volume of the authors' work on electrical machinery. Vol. I, already in its second edition, deals with the general principles of electromagnetic induction, transformers and rotating machines. Vol. II covers the insulation, mechanical construction, and ventilation of the same classes of equipment. The third volume is devoted to calculation and design and, like the others, it is written to meet the requirements of students as well as engineers in practice.

The first four chapters present a detailed treatment of the magnetic circuit; leakage; iron, copper and mechanical losses; and the heating and cooling of windings and cores. The subject matter of these chapters is of general applicability and takes account of the results of the latest researches. Difficult calculations are explained by numerical examples based on data from practice. The next chapter, on the geometrical loci of asynchronous machines, deals with the diagrams of the ordinary asynchronous machine and cascade combinations, numerical examples again being included.

The remaining chapters are concerned with transformers, asynchronous, synchronous and d.c. machines, rotary convertors, and a.c. commutator machines. Each of them is relatively short, demonstrating the importance of the introductory general treatment in simplifying the study of electrical machines as a whole. Once the general treatment is mastered the reader can proceed to the chapter dealing with any particular class of machine, and there he will find an explicit statement of the practical requirements to be borne in mind, together with fully worked examples of the design calculations. The examples chosen in the chapter on a.c. commutator machines are a single-phase traction motor, three-phase series and shunt motors, and self- and separately excited three-phase exciters.

The authors combine conciseness with lucidity to an unusual degree and meet all the ordinary requirements of designers and advanced students. For those who require further information there are references in the text to a classified bibliography of over 600 items.

The Mysteries of the Atom. By H. WILSON. London: Chapman & Hall, Ltd. 10s. 6d.

The author of this book gives an account in simple language of the evolution of present ideas regarding the composition of the universe. He does not go deeply into technical detail, although the chapter on space, time and relativity includes a good deal of mathematics of the simple order, which are also to be found in appendices dealing with the theory underlying some of the experiments described in the text.

In the opening section a brief account is given of the classical view of matter and electricity. This is followed by an account of how new discoveries have supplanted the old deterministic view. The major portion of the book deals with new ideas about ultimate particles and the microscopic structure of the universe. The work concludes with a treatment of large-scale phenomena needing new conceptions of time and space.

Advanced Practical Mathematics. By W. L. COWLEY. Pp. 271; illus. London: Sir Isaac Pitman & Sons. Price 15s.

In the ordinary text book on engineering mathematics, which deals with the applications of mathematical theory to engineering problems, an equation is considered to be solved when a symbolic expression for the unknown quantity is found, and the important matter of numerical evaluation receives comparatively scant attention. Mr. Cowley's work is almost entirely devoted to the subject of the calculation of numerical results, and it is thus practical in the real sense of the word. The book has been written for those who have a sound knowledge of elementary mathematics up to, and including, the rudiments of the calculus.

The range of calculation work covered includes the numerical evaluation of formulæ, the solution of algebraic equations, numerical integration, and the solution of differential equations. There are also admirable chapters dealing with the theory of dimensions, with the determination of algebraic expressions to fit curves and approximately to represent transcendental functions, and with practical applications of the calculus of finite differences. The methods of calculation are clearly set out and explained in detail. The worked illustrations are drawn almost entirely from mechanical and aerodynamical fields, and the electrical student who uses this book will have to bear in mind that the author uses i for the imaginary unit.

The book is worthy of very high commendation. The author has covered with great ability a field which has been largely neglected by writers on applied mathematics, and his work will be of the greatest assistance to design and research engineers, who are professionally concerned with the translation of symbolic results into numerical magnitudes. The utility of the book to the student would have been increased by the inclusion of a selection of exercises for solution.

* * *

Shorter Notices

"Radio Communication: History and Development," by W. T. O'Dea, B.Sc., A.M.I.E.E. Pp. 96; 58 illustrations. London: H.M. Stationery Office. Price 2s. 6d. (by post 2s. 9d.).—This brief and profusely illustrated Science Museum Handbook traces the history of radio communication from what were inexplicable phenomena in 1780 up to the most modern developments. Some of the subjects covered are: Early experiments, types of detector, the growth of commercial telegraphy, the thermionic valve, telephony and broadcast transmission, the development of the broadcast receiver, television, loudspeakers, and microphones. The illustrations include historical apparatus from the museum collections and elsewhere, early and modern transmitters, and several drawings and diagrams.

"Numerical Studies in Differential Equations"—Vol. 1, by H. Levy and E. A. Baggott. Pp. 238. London: C. A. Watts & Co., Ltd., 12s. 6d.—This work describes methods that have been used in practical tuition for over ten years in the mathematical laboratory at the Imperial College of Science and Technology. This, the first volume, deals only with the solution of ordinary differential equations and the numerical examination of the properties. A second volume is promised in which determination of characteristic numbers and the investigation of orthogonal practice will be included.

"Handbook for Electric Welders." Edited by J. H. Paterson. Pp. 152; figs. London: Murex Welding Processes, Ltd. Price 2s. 6d.—Four editions of this useful book have been called for in two and a half years. The present edition, to which ten authors have contributed, has undergone considerable revision and much of the elementary information contained in earlier issues has been omitted.

In the Courts

IN the Chancery Division last week Mr. Justice Crossman had before him a motion by the Cabaret Electric Co., Ltd., (trading as the Motor Roller Distributing Co.) against Marconi's Wireless Telegraph Co., Ltd., for an interim injunction against the defendants based on Section 36 of the Patents Act, which related to threats of an action.

Mr. Moritz, K.C., for the plaintiffs, said his clients were importers from abroad and dealers in wireless sets for use in motor cars. Plaintiffs complained that just before the Motor Show the defendants by a letter and notice to traders implied that features controlled by them and the British Wireless Licensing Pool had not been licensed by them and there was the threat of a writ. The circulars were sent to plaintiffs' customers. Counsel contended that the circular constituted an actionable threat and that his clients were entitled to an injunction. As the result of the circular plaintiffs' customers were cancelling orders for the sets.

Mr. Watson said on the evidence the alleged threat was justified within the Section of the Act, having regard to the defendants' evidence that there was an infringment of their patents.

His Lordship, whilst being of opinion that the notice amounted to a threat, said that the plaintiffs had failed to answer the defendants' allegation that there had been infringement of their patents. He made no order on the motion. The costs would be costs in the action.

An Unlicensed Transmitter

At Norwich on November 3rd George H. Barker, a salesman, was prosecuted for operating a wireless transmitting equipment without a licence. It was stated that he had operated the transmitter at Sprowston for a period of four years and had caused considerable trouble to radio listeners. He was fined £4 10s. and ordered to pay 5 guineas costs.

Neon Installations, Ltd.

In the Companies Court on Monday Mr. Justice Eve had before him a petition for the compulsory winding up of Neon Installations, Ltd. For the petitioners Counsel said the matter had been twice adjourned for the company to settle with its creditors. Nothing had been done since the last adjournment and he asked for a compulsory order.

Counsel for opposing creditors asked his Lordship to stand the petition over for the company to formulate some scheme. It was in the interests of the creditors to let the company go on. Counsel for the company said the prospect of raising further capital had not matured.

His Lordship said that the sooner the company was wound up the better and made a compulsory order.

Compensation Claim

The hearing was resumed last Friday at the Stafford County Court, before Judge Ruegg, K.C., of an action brought by Mrs. Florence May Keeley, Friar Street, Stafford, against the English Electric Co., Ltd., for an award under the Workmen's Compensation Act, in respect of her husband, William Thomas Keeley, who died on June 8th last following an electric shock sustained while working at the Central Electricity Board's New Mills sub-station.

On behalf of the company, Mr. John D. Healy, of Manchester, denied liability and maintained that the accident did not occur in the course of the deceased's employment.

His Honour asked Mr. Healy if he could suggest anything that Keeley was doing that was not part of his work. Mr. Healy replied that he could not suggest that he was doing anything that *was* a part of his work. In his opinion, it was an attempt to stretch the law to a point to which it has never been stretched before. Keeley had no reason to be at the switch in question, whether it was alive or not; he probably went there out of curiosity. There was no suggestion of suicide.

His Honour said he could not think of any reason except suicide which would exculpate the defendants.

Evidence was then called for the defence, and judgment was reserved.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON November 1st the Prime Minister, in reply to Mr. H. Williams, who asked when the second reading of the Electricity Bill would be taken in the Commons, said that if that question were repeated next week he would be able to answer. There were several outstanding matters.

The Wessex Scheme

On October 31st Sir Gifford Fox asked the Minister of Transport whether the Electricity Commissioners had now reached any understanding with the Air Ministry on the subject of the proposal of the Wessex Electricity Company to carry its line a quarter of a mile to the north of the existing Bicester aerodrome, and to which the Air Ministry, despite local feeling, continued to object.

Mr. Hore-Belisha said that the Wessex Electricity Company submitted an amended route for the proposed line to which no objection was taken by the Air Ministry, and on September 26th he gave his consent to the erection of the line.

Foreign Radio Sets

On November 5th Mr. Hutchison asked the President of the Board of Trade whether his attention had been drawn to the fact that the number of foreign wireless sets imported into this country during the first nine months of this year was 53,984 as against 25,321 during the corresponding period of 1933; and whether any steps were being taken to reduce such imports.

Mr. Runciman said he was aware of the fact to which attention was drawn. Any question of an increased duty on wireless sets was a matter for the Import Duties Advisory Committee in the first place.

Electric Cut-outs in Aeroplanes

On October 31st Captain Strickland asked the Under-Secretary of State for Air if any safety switch had yet been invented for automatically cutting out the electric circuits in aeroplane engines in the event of violent impact, thus minimising the danger of fire; and whether any such device had yet proved satisfactory.

Sir P. Sassoon said that three designs of such switches had been investigated and tested. Each fulfilled the functions for which it was designed and approval had been given for their use in civil aircraft.

Wiring and Rates

On November 5th Mr. Herbert Williams asked the Secretary of State for Scotland whether his attention had been drawn to the case reported at Haddington on September 20th, where the local assessment committee had endeavoured to increase the assessable value of a house on the ground that the house had been wired for electric light; and whether he was prepared to take steps to safeguard people who had their houses wired from the risk of being penalised by higher assessments.

Sir Godfrey Collins said he understood that the case referred to was that of a house in Haddington, the owner-occupier of which was successful in an appeal to the East Lothian Valuation Committeee against an increase of £2 made by the assessor in the annual value of the house. Having regard to the provisions in the Lands Valuation (Scotland) Acts for the making of appeals he had no reason to consider that the interests of house-owners or occupiers were not adequately safeguarded.

Mr. Insull's Defence

MR. SAMUEL INSULL disclosed last week that in 1926 Mr. Baldwin offered him the position of chief of the British grid system. The statement was made in the course of his answer to charges of fraud in connection with the colossal power concerns of which he was the head.

He told the Chicago Court the story of his early days in London (where he was born) when after a period as an errand boy and later as secretary to a publisher he came into contact with Edison as assistant to his London representative. Soon afterwards, in 1881, he went to the United States and acted as Edison's secretary, thus acquiring a close acquaintance with electrical and business matters.

Mr. Insull recounted his activities in the American electricity supply industry dating from the early 'nineties of last century (he is now seventy-five), his formation of the Illinois Public Service Co. and the Commonwealth Edison Co., and the way in which he raised the necessary money.

At the height of his success he was invited to London to give evidence before a Royal Commission on electric power, and it was at this time (1926) that Mr. Baldwin made him the offer referred to above. Mr. Insull said that he was tempted to accept the position but out of loyalty to his colleagues and investors he declined it.

When the financial crisis overtook the United States in 1929 he was confident that his concerns were sound enough to bear the strain, and his confidence received the support of President Hoover and Mr. J. D. Rockefeller. He actually launched a $200,000,000 expansion scheme, but events proved that he and his supporters had taken a wrong view of the trend of affairs.

Mr. Baldwin, when questioned last week with regard to Mr. Insull's statement, said that he had no comment to make on the matter.

Under cross-examination Mr. Insull said that he held more of the stocks of his companies when they went down than at the time of their prosperity. He admitted that he had ordered his associates to deal in the companies' shares, but that was no more than the United States Government had done to support stocks at the beginning of the slump. He said that he was now penniless, but admitted that his salaries in 1930 and 1931 totalled £100,000 a year.

Questioned regarding his flight to Europe when he knew that he had been indicted, he said that he had left the United States to avoid being persecuted as part of a political campaign.

The cross-examination was concluded on November 3rd.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures

Meeting of Creditors—A Correction

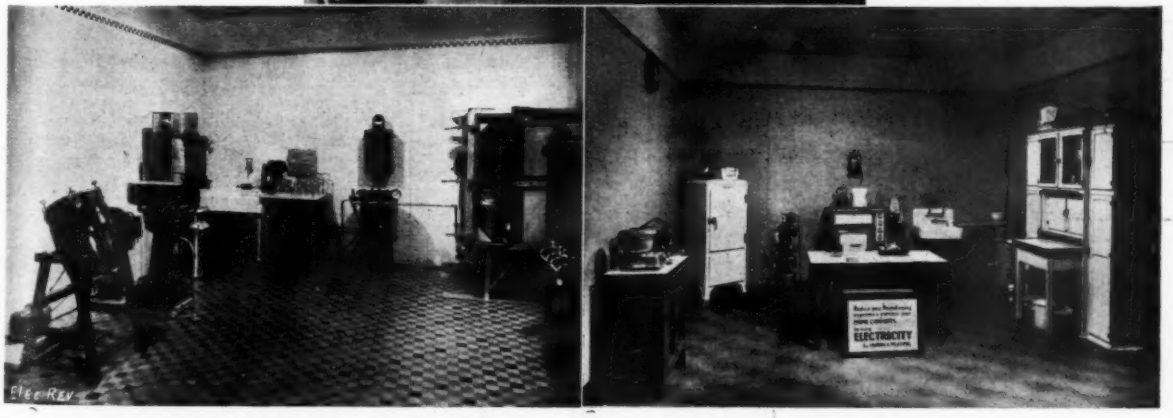
S. S. Caro, M. Caro and C. T. Edwards (S. Caro & Co.), York Passage, High Street, Birmingham.—In our edition of the 12th October, 1934, it was, referring to the recent meeting of Creditors of the above, erroneously stated that the Creditors resolved that the matter should be administered in bankruptcy. It has since been pointed out to us that no such resolution was in fact passed by the Creditors and that the requisite majority of Creditors have consented to a Deed of Assignment for their benefit. We regret the mis-statement and tender our apologies to Messrs. S. S. Caro, M. Caro and C. T. Edwards for any annoyance and inconvenience that they may have suffered thereby.

Holophane Specifications

Holophane, Ltd., announces that it has now passed the 10,000 mark in specifications. The company claims that its illuminating-engineering service was the pioneer of lighting specifications as a service for all desiring planned information for new installations.

The Harrogate Electrical Exhibition

The Harrogate Corporation Electricity Department (borough electrical engineer, Mr. Neil McLean, A.M.I.E.E.), has just concluded an exhibition at the Royal Spa Rooms. The opening ceremony was performed by the Lord Mayor of Bradford, Captain A. W. Brown. Arrangements were made for the exhibition to run six days only, but owing to its success it was decided to continue it for another week. The exhibition was arranged in the form of a house consisting of dining-room, sitting-room, two bedrooms, kitchen, bathroom and laundry, each of which was furnished in the ordinary way, and showed a complete range of electrical appliances working under normal conditions. There was also on show an electrically equipped dairy, and a large assortment of electrical farm appliances. Catering was also undertaken in a section of the hall, which was arranged as an all-electric café. Two cookery demonstrations were held each day, whilst there were also lectures on lighting, water heating, and the many other uses of electricity by experts from E.L.M.A., E.D.A., and manufacturers. The Harrogate undertaking has at present on hire 1,260 cookers and 1,176 water heaters, of which number 364 cookers and 286 water heaters were issued during last year. The area of supply is approximately 200 sq. miles with a population of 62,000, and as the average consumption for domestic purposes per head of the population is 173 kWh per annum the Department has a very high place amongst the undertakings in Great Britain. Arrangements have been completed for Harrogate Corporation to take over the Ripon electricity undertaking, which at present receives a bulk supply from Harrogate.



The Harrogate Electrical Exhibition. Above: The bathroom. Left: The electrically equipped dairy, and (right) the electric kitchen

An Australian Contractors' Association

We learn that a section of members of the Electrical Federation of Victoria has recently formed an Electrical Engineering Contractors' Association. The new body is independent of the Federation's administration, but, at the same time, it is not intended as a break away from that organisation, membership of which is retained. The Association comprises most of the leading contractors in the State.

Registered Electrical Contractors

Applications for Registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting :—

Jones, W. L. & F. M., Cobham, Surrey.
Roberts, G. W., Birkenhead.
Davis, Syd (West Bromwich), Ltd.
Hall, Wm., Masham, Yorks.
Park Electrical Co., Birkenhead.
MacLean, D. M., Richmond, Yorks.
Keating & Miskin, Ltd., Blackheath, S.E.3.

At the same meeting ten applications were declined.

A Radio and Gramophone Handbook

In ten years *The Wireless and Gramophone Trader* Year Book and Diary has become a complete reference book to the trades. The 1935 edition contains a total of some 256 pages, including a diary. In the directory section are 1,800 addresses of manufacturers and wholesalers, together with their telegraphic addresses and telephone numbers; 1,300 proprietary names of products, and a buyers' guide arranged under more than 200 different headings. One very useful feature is the publication of complete specifications of over 400 receivers and radio-gramophones by about sixty manufacturers, while there is also a section giving the characteristics of all the current types of valves on the market. Other subjects dealt with are the legal aspect of radio trading, licences, the public performance of gramophone records, trade associations, hire purchase, electrical interference, mains voltages in over 1,000 places and districts, and servicing information. The Year Book is available only to those connected with the radio and gramophone trades, and costs 5s. 6d. (or 3s. 6d. to subscribers to the *Wireless and Gramophone Trader*), and is obtainable from The Trader Publishing Co., Ltd., Subscription Department, Dorset House, Stamford Street, S.E.1.

The Rubber Exhibition

The Rubber Exhibition which Sir Philip Cunliffe-Lister, Secretary of State for the Colonies, opened on November 1st at the Science Museum, South Kensington, is a thoroughly practical demonstration of how rubber is procured, processed and utilised in hundreds of ways. The whole series of processes from plantation to users in industry are shown, together with the necessary machinery (much of it in operation), supplemented by models, photographs, diagrams and samples. The uses of both rubber and gutta-percha in cable and wire manufacture are shown, as well as the application of electricity in various processes of manufacture, for instance, in vulcanising, the latest types of apparatus being on view. One of the most important of the recent developments, the manufacture of hollow goods by electrodeposition of the liquid latex,

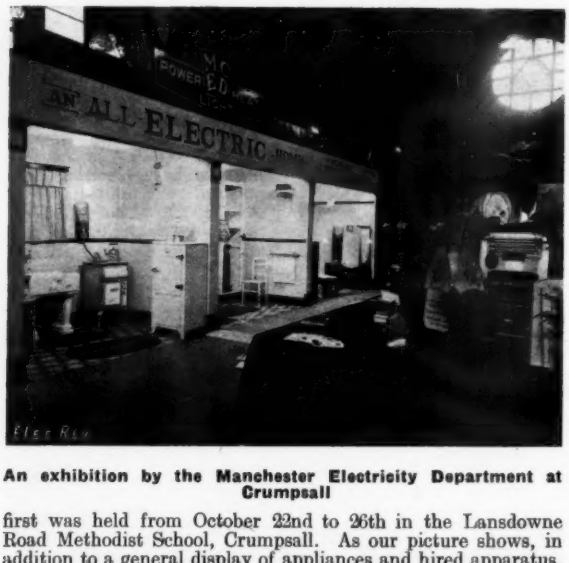
is demonstrated, the electric current being passed through the latex bath, while the anode, in the form of a mould, collects the rubber film. A valuable section is devoted to scientific and testing appliances, including an ingenious electrophoric apparatus to detect the movements of the negatively charged rubber particles under the action of an electric current, various types of hysteresis machines, &c. Among the manufacturing exhibitors are: the British Hanovia Quartz Lamp Co., Ltd., the General Electric Co., Ltd., W. T. Henley's Telegraph Works Co., Ltd., Siemens Brothers & Co., Ltd., and the Telegraph Construction and Maintenance Co., Ltd. The British Electrical and Allied Industries Research Association makes a comprehensive display. The exhibition remains open until April next.

Electricity at the Motor Cycle Show

Owing to the vibration which a motor cycle accumulator has to withstand, electrical equipment has for many years been kept to a minimum. Of late, however, better positioning and damping, together with the sturdier construction of the battery, has led to a change, evidence of which is provided at this year's Motor Cycle Show at Olympia, in the rise in the popularity of coil ignition from 10.5 per cent. in 1932 to 21.6 per cent. this year. Apart from standard lighting sets, a range of spotlights and automatic "stop" lights are being shown by Joseph Lucas, H. Miller, and the Bosch Co., while a wide range of instruments is on view at the stands of the Cooper-Stewart Engineering Co., Ltd., and S. Smith & Sons, Ltd. Chromium finish is still much in vogue, and plating equipment is being exhibited by W. Canning & Co., while a large variety of rubber goods can be seen at the East London Rubber Co.'s stand. Various small electrical accessories are included in Brown Bros.' exhibit, and a good selection of enamel finishes and varnishes is displayed by Pinchin, Johnson & Co., Ltd. The show closes to-morrow (Saturday).

Exhibitions at Manchester

During the winter Manchester Corporation Electricity Department is holding four exhibitions in various residential areas around Manchester in schools and public halls, and the

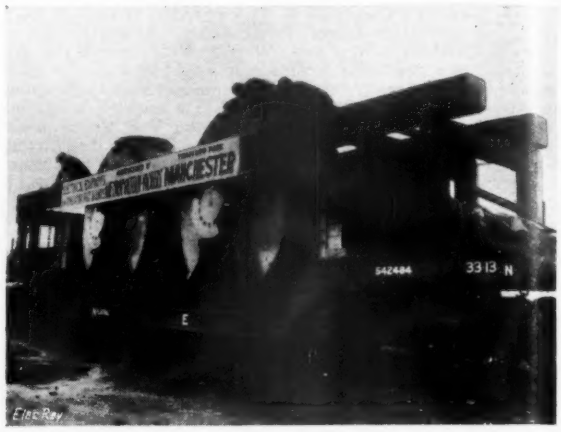


An exhibition by the Manchester Electricity Department at Crumpsall

first was held from October 22nd to 26th in the Lansdowne Road Methodist School, Crumpsall. As our picture shows, in addition to a general display of appliances and hired apparatus, four model rooms were exhibited completely furnished, and electrically equipped as a typical "all-electric" home. Mr. H. C. Lamb, the chief engineer and manager of the Electricity Department, informs us that great interest was shown by the visitors, particularly in the model house. Demonstrations of electric cookery and lectures on sales schemes and tariffs were given in a separate room. The exhibition was visited by 1,400 people and a good number of orders and inquiries were received.

The Transport of Large Equipment

One of the largest transport feats has recently been completed by the London and North-Eastern Railway. The last of twenty-six consignments of electrical equipment left the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd., last week for Budapest, a distance of 1,300 miles.



"Metrovick" plant leaving Trafford Park for Budapest

The equipment was loaded on "crocodile" wagons, and travelled *via* the L.N.E.R. train-ferry from Harwich to Zeebrugge, thence by rail through Belgium, Germany and Austria. The journey is being made in the same wagons in which the equipment left England. The consignments are for locomotives and sub-stations of the Hungarian State Railways. Our picture shows the last consignment leaving Trafford Park.

E.I.B.A. (Birmingham) Dance

For the fourth time the Birimingham and District Branch Centre of the Electrical Industries Benevolent Association held its annual dance at the Magnet Club, Witton, on November 2nd. The programme was a varied one, the dances being interspersed with competitions of a novel character. Mr. F. W. Martin, vice-chairman of the Centre, introduced the new chairman, Mr. T. W. Birkett. Mr. A. G. Huddleston has been appointed honorary secretary of the Centre in succession to Mr. R. M. Verity, and communications should be addressed to him c/o the General Electric Co., Ltd., Witton, Birmingham. Subscriptions and donations should be forwarded to Mr. H. N. Whitford, honorary treasurer, at the same address.

Price Reductions

"Diamond H" Switches, Ltd., announces that it has made reductions in the prices of its "Diamond H" range of rotary switches.

A Battery Window Dressing Competition

We have received from the Ever Ready Co. (Great Britain), Ltd., a list of the eighty-one prize-winners in its window dressing competition held throughout the country. The winner of the special prize of £50 for the whole of the British Isles was Mr. E. V. Lomas-Smith, 29, High Street, Camberley.

The Swansea Civic Centre

In our last issue we described the electrical installation at the new Swansea Civic Centre, and we now reproduce below a photograph received from Siemens Electric Lamps & Supplies, Ltd., showing the floodlighting of the exterior.

Electrical Manufacturing in Poland

According to official returns, the value of Poland's electrical manufactures during the first half of the current year exceeded £1,250,000. One of the main items of production was electric lamps, of which 3,283,000 were made valued at

The Swansea Civic Centre which has a permanent floodlighting installation

£160,000. The output of insulated and lead-covered wiring was valued at £270,000; electrical machinery at £90,000; accumulators at £97,000; telephone apparatus at £40,000; and radio apparatus at £62,000.

Recent Contracts

The Borough Theatre, Stratford, E., has been reconstructed as a cinema and under the name of "The Rex," was reopened on Monday last. The emergency lighting is provided by a battery supplied by the Hart Accumulator Co., Ltd.

The Travancore Government has recently placed contracts in connection with the Pallivasal hydro-electric scheme. Messrs. Volkart Bros., representatives of Messrs. Brown, Boveri, Switzerland, have received the order for Escher Wyss turbines, coupled to 11-kV alternators, a control board, 11/66-kV transformers, and all outdoor gear to complete the Pallivasal general station, the value being Rs.5.7 lakhs. An order has been placed with Associated Electrical Industries (India), Ltd., for 11/66-kV transformers by the Metropolitan-Vickers Co., and three outdoor type sub-station switchgear of B.T.H. manufacture at a cost of Rs.5.5 lakhs. The General Electric Co. (India), Ltd., has received the order for all 33-kV and 11-kV sub-stations for the whole of the scheme, costing about Rs.1.6 lakh.

The Passenger Transport Department of the Nottingham Corporation has placed an order with Leyland Motors, Ltd., for thirty Leyland-G.E.C. trolley buses of the six-wheel double-deck type. The complete electrical equipment for these vehicles will be manufactured by the General Electric Co., Ltd., at its Witton engineering works, and will include one 80-h.p. Witton motor per bus arranged for field regulation, together with all the necessary control gear.

The Scottish Contractors' Year Book

We have received the Year Book and Diary for 1934 of the Electrical Contractors' Association of Scotland. As in previous years the literary matter is preceded by the portraits of the president—this year Major R. E. Douglas—the vice-president, the secretary, and the chairmen of the various branches. The objects and scope of the Association are explained, and there are a number of articles and a fund of information of interest to the electrical contractor. The publication can be obtained from the Association at 55, Frederick Street, Edinburgh, price 3s. (3s. 6d. post free).

The Palestine Radio Market

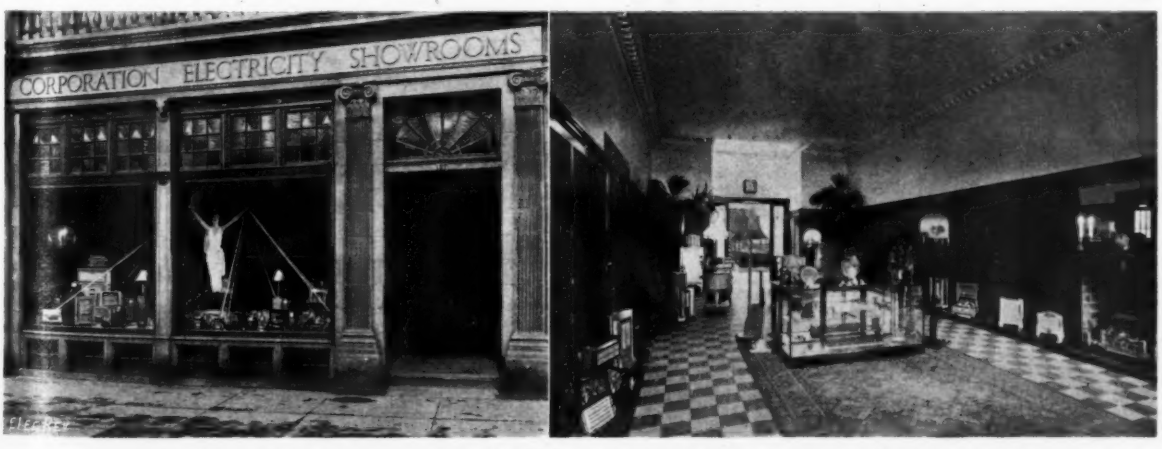
The Department of Overseas Trade has prepared a report on the market for radio apparatus in Palestine, based on information received from the Commercial Agent at Haifa. This has been issued by the Department to firms whose names are entered on its Special Register. Copies of the report can be obtained on application to the Department, 35, Old Queen Street, S.W. (Reference A.Y. 12729.)

The Contractors' Dinner

The annual dinner of the Electrical Contractors' and Allied Associations is to be held on January 29th.

The New Edinburgh Showrooms

The new showrooms of the Edinburgh Corporation Electricity Department were formally inaugurated by Lady Thomson, the Lady Provost, on October 31st. Ex-Bailie Gardner, the convener of the Electricity Sub-committee, said that consumers required a central bureau at which they could obtain information and advice on matters relating to the use of electrical appliances. It was found that the former premises were not suitable for their purpose. The Department did not sell any appliances to the public, the showrooms being used solely for demonstration and exhibition purposes. There was, therefore, no competition with the private trader. Electricity sold for domestic heating and cooking purposes in 1924 totalled 2,682,000 kWh, while during the current year the output had increased to 21,682,000 kWh. Last year's domestic consumption was greater than the total sales of electricity for all purposes in 1919. The accompanying illustrations are views of the exterior of the showrooms and of the main salon.



The exterior and the main salon of the new showrooms of Edinburgh Corporation Electricity Department

G.E.C. Birmingham Branch Extensions

New showrooms were to be opened yesterday (Thursday) at the Moor Street, Birmingham, branch of the General Electric Co., Ltd. This branch was first established in 1894 at 39, Corporation Street, Birmingham, and was moved in 1908 to Barwick Street. The present premises were taken over fourteen years later, and from this address the company's Midland area activities are controlled. It is under the direction of Mr. F. Boyes, and employs a staff of over 250. The new showrooms are on the ground floor and include a spacious general showroom (shown in the accompanying illustration) in which are displayed a wide variety of lighting fittings, and a comprehensive range of electric fires. There is also a section devoted to domestic electrical appliances, including cookers, grillers, toasters, wash boilers and wringers, and a radio demonstration room.

The new lighting fittings showroom at the G.E.C. Birmingham Branch

A "Lewcos" Comedy

For its fourth production the Lewcos Dramatic Society (London Electric Wire Co. and Smiths, Ltd.), chose an excellent comedy in "The Rotters," by H. F. Maltby, the play being enacted at the Guildhall School of Music Theatre, London, E.C.4, on Tuesday evening. So well was it interpreted that one lady in the audience was heard to say, "I would like to stay to see it over again!" a well-deserved tribute to the producer, Mr. F. Lockett, and his talented company, at least three of whom were making their stage début. Following the presentation of bouquets, Mr. W. J. Terry, chairman of the company, congratulated the Society. The next production has been arranged for April 2nd, and will be eagerly anticipated.

A Swedish Building Centre

Stockholm is the latest city to open a Building Centre based on the example set by the Building Centre in London. The new venture known as the Byggtjanst, has been organised by the Architectural Association in Stockholm in conjunction with the Builders' Association, property owners, and various other technical associations who have representatives on the board of directors. It is situated in one of Stockholm's busiest shop-

ping streets and most of the leading manufacturers in the Building Industry are represented. As a compliment to the London Centre, Mr. F. R. Yerbury, the director, was invited

Members of the Manchester Section of the E.P.E.A. at the works of Switchgear & Cowans, Ltd.

to attend in connection with the opening and to deliver a public lecture on the London Building Centre. Arrangements have been made for close collaboration between the two Centres in order to interchange information on market prospects for goods manufactured in either country. It is hoped that there will be an interchange of exhibitions in each city of special materials and equipment manufactured in one country and not in the other.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price. November 7th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3⅜d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti friction Metals—		
Grade I ... ... per ton net	£206	—
Grade II ... ... ,,	£141	£1 dec.
Grade III ... ... ,,	£69	£1 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	6¾d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	8¼d. to 9d.	¼d. inc.
c ,, Wire, basis ... ... ,,	7¼d.	¼d. inc.
c Copper Tubes (solid drawn)... ... ,,	9¼d.	¼d. inc.
g ,, Bars (best selected)... ... per ton	£58	£2 inc.
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£30 10s.	—
g ,, ,, Sheets ... ,,	£30 10s. to £31	5s. to 10s. inc.
d ,, ,, Wire Rods ... ,,	£35 10s.	—
d ,, ,, H.C. Wire ... per lb.	6¼d.	—
f Ebonite Rod ... ... ,,	1/6 to 2/– plus	—
,, Sheet ... ... ,,	1/3 to 1/6 ∫ 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5½d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. qual. ... ,,	£20	—
g Lead, English Pig ... ... ,,	£12 10s.	—
g Mercury ... ... per bot.	£11/12/6 to £11/15	—
c Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10¾d.	—
p ,, ,, rolled strip & Sheet ,,	10¾d.	¼d. dec.
p ,, ,, wire ... ... ,,	11¼d.	¼d. inc.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	7 7/8d.	1/8d. inc.
r Steel, magnet, in bars ... ... ,,	7¾d.	—
g Tin, Block (English) ... ... per ton	£228 15s. to £230 15s.	£1 15s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew ,Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

Works Visit

About forty members of the Manchester Section of the Electrical Power Engineers' Association visited the Old Trafford works of Switchgear & Cowans, Ltd., on October 27th. The visitors were conducted by members of the staff through the various departments where specialists were stationed to explain processes and products. They were particularly interested in S. & C. internal isolation gear awaiting dispatch to the Westminster Electric Supply Corporation, Ltd., the C.E.B. and Reigate Corporation, C.E.B. and Workington Corporation, Blackpool Corporation, Stretford Corporation, Bury Corporation, Coventry Corporation, and the South Metropolitan Electric Light & Power Co., Ltd. The company's mining type switchgear was also examined, and the visitors displayed a keen interest in the methods employed in the design of mining electrical gear constructed for working under most arduous conditions and stringent regulations.

The Timber Trade

Our Timber Trade Correspondent reports that this market holds larger stocks of European and Canadian woods than is usual at this time of year, but on the other hand the consumptive demand is keeping up well. Spot prices for lower quality woods are ruling somewhat unsteady, the weakness being largely due to the decline in shippers' prices for goods for this year's delivery. Hardwoods, too, are moving more largely into consumption for the time of year, especially British sawn mahogany, as well as Canadian and other woods from Empire sources. American woods are unsettled in demand. The "luxury" woods, *i.e.*, rosewood, satinwood, ebony and the like, continue in small demand and supply. Except in the luxury woods everything in the timber line is plentiful of stock.

For Sale

Portsmouth Corporation Electricity Department has for disposal nineteen single-phase 200-V 50-cycle motors.

(See our classified advertisements.)

Trade Announcements

The address of the Alfa-Laval Co., Ltd., is now Great West Road, Brentford, Middlesex. (Telephone : Ealing 0116.)

Mr. Walter Boyes has taken over the business of Boyes & Beecroft, electrical engineers, Haggersgate, Whitby.

New Electric Vehicles

The accompanying illustration shows in the foreground a 5/6-ton Electricar six-wheeler electric vehicle which is one of six on order for the Sheffield Corporation. The vehicle in the

Two electric vehicles recently constructed by Electricars, Ltd.

background is the 1935 model 8-cwt. Electricar with foot-operated controller. Both these vehicles were made at the Birmingham works of Electricars, Ltd.

New Electricity Showrooms at Exeter

The Exeter City Council has signed a contract for the purchase from Messrs. Woolworths, Ltd., of premises formerly occupied by that company in Fore Street. The purchase price is £18,000, and after adaptation the premises will be utilised as showrooms, offices and stores for the Corporation Electricity Department. The Exeter electricity undertaking, under the direction of Mr. A. L. Keet, the electrical engineer and manager, has made considerable progress during the past few years, and the existing showrooms in Sidwell Street have long been inadequate. The following figures show the rapid development of the undertaking during the past five years :— Consumers in 1929, 7,176; electricity sold 6,000,000 kWh; area of supply, 19½ sq. miles; revenue, £75,000. Consumers last year, 15,651; electricity sold, 18,000,000 kWh; area of supply, 40 sq. miles; revenue, £137,000. The new premises should result in a further expansion of the undertaking.

The Mount Royal Flats

Referring to the article on this subject in our last issue, the Cambridge Instrument Co., Ltd., informs us that it provided the instrument equipment for the heating and ventilating plant, including a CO_2 recording outfit, three combined indicating and recording thermographs for the flue-gas and hot-water temperatures, two indicating and recording pressure gauges for the boilers and steam mains and two electrical distance temperature recording outfits for the air temperatures.

New Catalogues and Lists

Thermega, Ltd., 51-53, Victoria Street, London, S.W.1.—An illustrated and priced booklet advertising "Thermega" electric pads and blankets.

Parsons Oil Engine Co., Ltd., Town Quay Works, Southampton.—A catalogue of petrol and kerosene engines.

Hailwood & Ackroyd, Ltd., Morley.—Catalogues of lighting fittings.

Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester 6.—A leaflet describing "Goltone" pocket lamps.

Rhodes, Brydon & Youatt, Ltd., Waterloo Engineering Works, Gorsey Mount Street, Stockport.—A booklet on "Mopump" products.

W. H. Stone & Co. (Cardiff), Ltd., 16, Hill's Terrace, Cardiff.—A 56-page catalogue of domestic appliances.

Siemens Electric Lamps & Supplies, Ltd., 38/39, Upper Thames Street, London, E.C.4.—A catalogue of lighting fittings.

Electrical Equipment & Carbon Co., Ltd., 107, New Oxford Street, W.C.1.—A leaflet on bakelite shrouds.

British Thomson-Houston Co., Ltd., Rugby.—A booklet dealing with equipment for the woodworking and metal-working industries.

Bakelite, Ltd., 68, Victoria Street, S.W.1.—A new booklet "Bakelite Gears and Pinions," dealing with "Trefoil" non-metallic gear material. Also a copy of "Bakelite Progress."

Beacon Electrical Co., Stonhouse Street, Clapham, S.W.4.—Catalogue of electrical supplies.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—A leaflet on the type A.279 a.c. push-button star-delta starter.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.—Leaflets on magnetically operated contactor switches, the "Thermentor" cooker control and a new neon window display sign.

British Electric Domestic Appliances, Ltd., 3, Hanover Court, Moor Lane, E.C.2.—"Mary Ann" news for November.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—A new industrial vacuum cleaning catalogue.

Holophane, Ltd., Elverton Street, Vincent Square, S.W.1.—A floodlighting catalogue.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A booklet on water heating by electricity and a catalogue of tubular heaters.

Bankruptcy Proceedings

F. H. Pountney, trading as Bordesley Electrical Co., 164, High Street, Bordesley, Birmingham, electrical engineer and wireless accessories dealer.—The public examination herein took place at the Court House, Corporation Street, Birmingham, on October 31st. The unsecured liabilities were stated to amount to £3,085, and there was an estimated deficiency of £2,747. Debtor said he was formerly engaged as a traveller in the electrical trade, and commenced business on his own account as an electrical factor in 1917. He traded then at 162, High Street, Bordesley. The business expanded and debtor with two others formed a limited company, which, however, was wound up later. Debtor purchased the business from the liquidator for £400, and assumed responsibility for £1,000 of the old company's liabilities. For the first few years the business yielded a profit, but subsequently declined owing to a slump in trade. Debtor attributed his failure to assuming liabilities of the old company, selling wireless goods at an insufficient margin of profit, depreciation of stock, and slump in trade since 1931. The examination was adjourned.

J. Robertson, 68, Arran Road, Catford, S.E., electrical engineer.—The first meeting of creditors was held on November 1st at 29, Russell Square, London, W.C.1. Debtor's statement of affairs showed gross liabilities of £669, of which £295 was expected to rank for dividend. There were net assets of £197, leaving a deficiency of £98. He attributed his failure to the profits from the business being insufficient to cover overhead charges. The case being a summary one was left in the hands of the Official Receiver, as trustee.

H. Pickup, trading as "Electrical and Wireless Stores," 12, Frank Street, Barnoldswick, electrical engineer.—The public examination herein was held at the County Court, Bradford, on November 2nd. The statement of affairs submitted showed gross liabilities of £225, of which £220 was expected to rank for dividend, and there was a deficiency of £197. The debtor attributed his failure to taking over an insolvent partnership business and insufficient turnover. The examination was closed.

J. C. Law, Alma Villa, Mark, Somerset, electrical and radio engineer.—This debtor's public examination took place at the Guildhall, Wells, recently. It was stated that the liabilities amounted to £151, and there were assets of £78. The deficiency totalled £72. Debtor attributed his failure to lack of capital, competition by local firms canvassing in the district, and business inexperience. The examination was concluded.

J. Drake, 93, St. Leonard's Road, Windsor, electrical and wireless contractor.—The public examination of this debtor was held at the Town Hall, Windsor, recently. Debtor returned gross liabilities of £449, of which £390 was expected to rank for dividend. There were net assets of £50 and a deficiency of £339. The examination was adjourned.

C. Doherty, electrical contractor, 28A, New Cannon Street, Manchester.—Last day for receiving proofs for dividend, November 14th. Trustee, Mr. L. A. West, Byrom Street, Manchester, Senior Official Receiver.

R. F. Palmer, electrical engineer, 19, Church Street, Burnley.—Trustee, Mr. J. W. Carter, District Bank Chambers, Blackburn, Official Receiver, released October 30th.

R. B. Emerson, electrical engineer, 330, London Road, Westcliff-on-Sea.—Last day for receiving proofs for dividend November 17th. Trustee, Mr. W. D. C. Todd, 3, Cannon Street, E.C.4.

I. L. Lawrence, electrician, 11, Grand Parade, Brighton.—Last day for receiving proofs for dividend November 13th. Trustee, Mr. V. R. Fletcher, 8, Old Steine, Brighton, Official Receiver.

T. E. Harvey, radio and electrical engineer, 64, Leagrave Road, Luton.—Trustee, Mr. T. Bengough, 6, The Parade, Northampton, Official Receiver, released October 30th.

E. V. Day, radio dealer and engineer, 16, King Street South, Chesterfield.—Trustee, Mr. A. J. Rogers, 22, Regent Street, Nottingham, Official Receiver, released October 27th.

S. Colbert, electrician and wireless dealer, 350, Kirkstall Road, Leeds.—First and final dividend of 3½d. in the £, payable November 7th at 24, Bond Street, Leeds.

E. E. Lucas, wireless and electrical engineer, 1A, Station Road, Plymouth.—Trustee, Mr. A. N. F. Goodman, 11, St. Aubyn Street, Devonport, Official Receiver, released October 24th.

R. E. Baxter, electrician and wireless dealer, 77, Hackthorn Road, Sheffield.—Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver, released October 18th.

W. E. Magson, electrical engineer, 10, Castlegate, Malton, Yorks.—Public examination November 20th at the Court House, Scarborough.

W. S. Fray (R. E. Warren), electrician, 1, Albert Road, Torquay.—First and final dividend of 1s. 2d. in the £, payable November 7th at Exeter Bank Chambers, Broadgate, Exeter.

Company Liquidations

Lunar Electrical Co., Ltd., 3-7, New Street Square, E.C.—The accounts lodged under the compulsory liquidation of this company show total liabilities of £16,731 (ranking £13,312), assets of £3,219 (absorbed in the preferential and debenture claims), and a deficiency of £13,412 as regards contributories, the issued capital consisting of 100 ordinary shares of £1 each. The Official Receiver (who also acts as liquidator) reports that the company was formed in November, 1926, to acquire the business of the Lunar Electrical Co., and to carry on business as electrical machine and accessories merchants. The purchase price was agreed at £612, payable as to £98 in shares and the balance in cash, which was credited to the accounts of Wilfred Rendle Preston and Alfred Moreton Scales, the joint vendors, promoters and managing directors. The business, which dealt principally in lamps, had been carried on by Preston & Scales since February, 1926, at Sicilian House, Southampton Row, W.C. Preston was also a director of A. P. Maglen, Ltd., which carried on the sale primarily of automobile lamps. After the Lunar Co. had been registered about six months the two businesses were removed to New Street Square. Preston & Scales were also directors of Amalgamated Lamp Co. (Great Britain), Ltd., and the Pearl Electrical Co., Ltd., both of which carried on business as agents and factors for electrical goods. A large number of orders received by these two companies and by another concern called the Regal Electric Lamp Co., were passed on to the Lunar Co. and executed at a profit. At the date of a receiver's appointment on January 2nd, 1934, the amounts due by those associated companies were shown to be: Alamgamated Lamp Co., £3,314; Pearl Electrical Co., £2,204; and Regal Electric Co., £192. The receiver reports that nothing has been received yet in respect of those claims. On April 10th, 1933, a debenture for £5,700 was issued to Preston to secure money due or to become due to him, and on January 2nd, 1934, Mr. A. J. Loarridge was appointed receiver for the bondholder. It seems doubtful whether the assets will realise the amount claimed by Preston under his debenture. Preston says that the failure of the company is attributable to the keen competition in certain foreign and cheap British lamps which occasioned a loss of turnover and a much lower ratio of profit to the company. Scales thinks it is due to want of working capital caused by the indebtedness to the company of the associated concerns, and the Official Receiver is of opinion that the method adopted by the company of relieving the various firms and companies mentioned of a considerable portion of their liabilities to the company materially contributed to the failure.

A. Seward & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. Cross, Lancaster.

Meeting of Creditors

George Nobbs, Ltd.—A meeting of creditors will be held on November 13th at 11, Queen Victoria Street, E.C., to consider a resolution for the voluntary winding up of the company and the appointment of a liquidator, which is to be submitted to a meeting of shareholders on the same day.

The stand of the Coventry Corporation Electricity Department at the recent "Better Homes" Exhibition which was held in that city

Electricity Supply

Lighting, Domestic, Power

Airdrie.—CLYDE VALLEY AGREEMENT.—The Town Council has agreed to the Clyde Valley Electrical Power Co. acquiring the electricity undertaking in the town. The neighbouring burgh of Coatbridge has confirmed an agreement with the Clyde Valley Co. with regard to the undertaking in that burgh.

Ashford (Kent).—EXTENSION.—The Urban District Council is to extend the supply of electricity in the South Stour area, Mersham, subject to the approval of the Kent Electric Power Co.

Australia.—NEW SOUTH WALES.—Although the Government has threatened to introduce legislation to prevent local authorities in the southern highlands from purchasing electricity except from the State power station at Port Kembla, the Wingecarribee Shire Council has signed an agreement with the Berrima Power Supply Co. for the purchase of electricity in bulk. The Bowral Council is expected to make a similar decision, and the Company will then proceed with construction work, at a cost of £50,000, preparatory to beginning the generation of electricity.

Barking.—REMARKABLE PROGRESS.—The amount of electricity sold by the borough electricity undertaking during the year just ended was 12,422,000 kWh, representing an increase of 32.3 per cent., which is claimed to be the highest yet recorded in any part of the country. The number of consumers increased from 12,968 in 1933 to 13,806 this year, representing an advance of 6.4 per cent.

Barrow-in-Furness.—SWITCHGEAR DECISION.—The Electricity Committee has approved suggestions by the electrical engineer for remodelling and extending the e.h.p. switchgear, and the installation of remote-control gear at the Buccleugh Street Works.

Barton-on-Humber.—REDUCED CHARGES.—The local electricity supply company, which is a subsidiary of the North Lincolnshire & Howdenshire Electricity Co., Ltd., has reduced the charge for electricity from 10d. to 7d. per kWh.

Beaconsfield.—INQUIRY RESULT.—Following an inquiry held at Holtspur into the application of the Cookham & District Electricity Corporation, Ltd., to erect overhead lines in the Beaconsfield district, it has been decided that both h.p. and l.p. cables are to be placed underground, except for a distance of about 120 yds.

The Savoy Cinema, Ilford, floodlighted in red by four "Osira" lamps. Blue neon lighting is used for the name sign and the topmost parapet

Berwick-on-Tweed.—REDUCED CHARGES.—The Urban Electric Supply Co. is introducing the following scale of charges: Two-part tariff, running charge, 1¼d. per kWh (domestic rate); service charge for private dwellings with floor area of not more than 700 sq. ft., 50s. per quarter; "unit" charge under the two-part tariff business scale, 1¼d. until March, 1935, and 1d. afterwards. The flat rate of 8d. per kWh will be reviewed after the publication of the accounts of the undertaking for the year ending December, 1935. A 10 per cent. reduction in street-lighting charges will be made soon.

Blean.—SUPPLY EXTENSION.—The Rural District Council has agreed to the South-East Kent Electric Power Co., Ltd., erecting an overhead l.p. line and underground cables for supplying electricity to Sturry and Fordwich.

Brighton.—ALL-ELECTRIC HOUSES.—Houses of this type are to be built at Portslade, and in order to meet the demand for electricity a sub-station is to be built at a cost of £3,366. The equipment will include a four-panel e.h.v. switchboard, a two-panel l.v. switchboard, and two 250-kVA transformers.

SUB-STATION.—The increased load in the Tongdean Lane district renders it necessary for additional plant to be installed at the sub-station in that area, and the Electricity Committee has agreed to this being done at a cost of £2,876. At the same time there will be a change-over to a.c.

MAINS EXTENSIONS.—The mains are to be extended at a cost of £4,622.

Brinkworth (Wilts).—SUPPLY WANTED.—The Parish Council is negotiating for a supply of electricity for the village.

Caistor.—A SUPPLY.—The North Lincolnshire & Howdenshire Electricity Co. has informed the Rural District Council that arrangements are being made for extending the main cables to Caistor, and that it is hoped to have a supply by the end of the year.

Carlisle.—POWER CHARGES.—The City Council has adopted a lower scale of charges, representing a reduction of 20 per cent. on the present rates.

Chailey.—A SUPPLY NEXT YEAR.—The Uckfield Gas & Electricity Co. has informed the Rural District Council that it hopes to provide a supply of electricity to the isolation hospital and the surrounding districts by next summer. The Council has approached the Company with a view to securing an earlier supply.

Cromarty.—EXTENSION.—The Grampian Electricity Supply Co. is extending its supply to Cromarty. Electricity will be supplied from the Ross-shire hydro-electric station at Lochluichart.

Croydon.—THE YEAR'S PROGRESS.—In his 1933-34 report Mr. F. N. Rendell-Baker, chief engineer and manager of the Electricity Department, reveals that the amount of electricity sold again increased considerably, being 120,832,103 kWh, as compared with 105,388,505 kWh, the "local" supply rising from 68,953,400 kWh to 81,003,303 kWh. Working costs fell during the past year from 0.423d. per kWh to 0.389d. The number of consumers connected (4,715) again constituted a record, bringing the total to 42,223. This large increase included 2,303 new consumers under the rental-wiring scheme. Arrangements were made with builders to open all-electric show houses on their estates. Over 90 per cent. of the consumers took their supplies under the "all-in" tariffs, and there was an increase of more than 10 per cent. in the apparatus on hire. The new meter-testing and repair department achieved gratifying results in its first year of working, and the "rota" system of testing and repairing meters was successfully inaugurated, meters being changed at the rate of thirty a day.

Darlington.—LOAN.—The Corporation is to apply to the Electricity Commissioners for sanction to borrow £36,000 for prospective expenditure on electricity mains and £6,000 on meters.

Devizes.—EXTENSION.—The Rural District Council has approved plans submitted by the West Wilts Electric Light & Power Co. for an extension of the overhead lines to Market Lavington and Fiddington Sands.

Dover.—LOAN.—The Electricity Committee recommends application for a loan of £3,000 for general services.

Eccles.—SUPPLY EXTENSION.—The Town Council has decided to extend the mains so as to supply electricity to an estate at Winton, where 125 houses are to be erected (£1,043).

Eyemouth.—LIGHTING SCHEME BEGUN.—Following an agreement with Eyemouth Town Council, the Scottish Southern Electric Supply Co., Ltd., has started its scheme for lighting the burgh.

France.—POWER DEVELOPMENTS.—A message from our Paris correspondent states that approval has been obtained for the construction of a new 150,000-V line to feed the Marseilles network. This line, work on which is to start immediately, will run from Bagnols-sur-Ceze to Marseilles. It will comprise three cables of 239 sq. mm. section, and connect at Bagnols with the h.v. network linking the various power plants in the Pyrenees, Massif Central, and Alps regions. In the scheme to replace 1,250-h.p. turbines in the plant of the Forces Motrices du Rhône, a further sixteen 6,000-h.p. turbines are now being installed, and are expected to be in operation before the end of the year.

Gillingham (Kent).—REDUCED CHARGES.—The Town Council has adopted the following reduced charges: Domestic tariff. 12½ per cent. of the net rateable value per annum, plus ¾d. per kWh; special domestic tariff, 2½ per cent. of net rateable value, plus ¼d. per kWh where cooker or hot-water systems are installed; business tariff, 4s. per 100 W of lamps installed per quarter, plus ¾d. per kWh.

Guildford.—FRINGE ORDER.—The Woking Electric Supply Co., Ltd., is seeking a Fringe Order to enable it to provide

a supply to the village of Worplesdon, close to Guildford.

Hastings.—LOANS.—The Electricity Committee has obtained sanction to borrow £10,000 for house services.

MAINS.—Extensions are to be carried out at a total cost of £6,102.

India.—ELECTRIC POWER AT VERAVAL.—A supply of electricity for lighting and industrial purposes is to be provided at Veraval, an important port in the State of Junagarh, reports our Bombay correspondent. A central power station is under construction, and it has been decided to produce electricity at a pressure of 3,300 V. Applications for power have already been received, and the demand is likely to increase greatly with the completion of the harbour development project and the multiplication of mills and factories. It is estimated that the electrification project will yield a dividend of at least 6 per cent. per annum in the third year of its inception, and 10 or 12 per cent. in the fifth year.

Ilford.—LOAN.—The Electricity Committee is seeking sanction to borrow £20,000 for mains and services, and £5,000 for wiring installations.

Irish Free State.—DUBLIN.—The surveys of the Upper Liffey Valley in the district of Brittas in relation to the suggested new Greater Dublin electricity and water supplies have now been completed, and the findings are soon to be submitted to the Electricity Supply Board and the Dublin Corporation. The surveys were suggested by Dr. J. Buchi, of Zurich, Switzerland, and they were carried out by Herr Hug, a Swiss expert, assisted by Mr. T. Hallissy, director of the Free State Geological Survey, and by Mr. M. A. Moynihan, Dublin city engineer.

Jarrow.—NEW PLANT.—The North-Eastern Electric Supply Co., Ltd., is renewing and relaying all the electric cables in Jarrow. The scheme is to cost £30,000, of which £10,000 will be expended on new plant in connection with the change-over to a.c. The contractors for supplying and laying the cables are Callender's Cable & Construction Co., Ltd., and the work will be completed in March next. Jarrow has suffered badly through the industrial depression, three-quarters of the population being unemployed.

Leicester.—SUB-STATIONS.—The Electricity Committee is applying for sanction to a loan of £50,000 for sub-stations.

Manchukuo.—ELECTRICITY SUPPLY DEVELOPMENTS.—The visit of the delegation from the Federation of British Industries to Japan and Manchukuo has coincided with the publication locally of various particulars regarding the future of electricity supply in Dairen. Rapid progress is reported in the erection of the machinery at the Kanching power station, near Dairen, and it is hoped to start operations by the end of this year. With a capacity of 54,000 kW, this station, which has cost about £500,000, will be the largest in Manchukuo. It is proposed to enlarge it soon to 150,000 kW. According to the Japanese Press, certain items were obtained from England.

Mansfield.—NEW FEEDER.—The Electricity Committee is to provide an additional feeder cable between Eakring Road and Southwell Road at a cost of £1,000.

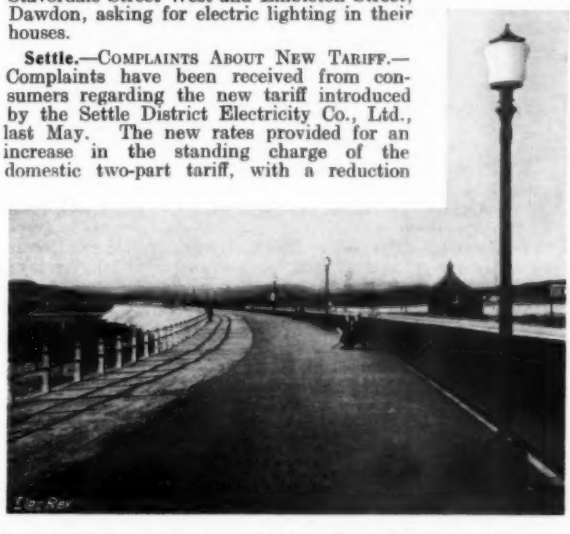
Morocco.—NEW POWER COMPANY.—A new company, the Société de l'Entreprise Electrique de la Banlieu de Marrakech, has recently been formed in Casablanca to establish an electric-power distribution system in the Marrakech district.

Potter's Bar.—ELECTRICITY FOR COUNCIL HOUSES.—The Urban District Council is to negotiate with the North-Metropolitan Electric Power Supply Co. to obtain electricity for 102 tenants of houses in the district.

St. Monance (Fife).—SUPPLY INAUGURATED.—An electricity supply has been switched on in the town. The cable was brought into the town by the Fife Electric Power Co.

Seaham Harbour.—PETITION FOR SUPPLIES.—The Urban District Council has received a petition from forty residents in Stavordale Street West and Embleton Street, Dawdon, asking for electric lighting in their houses.

Settle.—COMPLAINTS ABOUT NEW TARIFF.—Complaints have been received from consumers regarding the new tariff introduced by the Settle District Electricity Co., Ltd., last May. The new rates provided for an increase in the standing charge of the domestic two-part tariff, with a reduction of the "unit" charge from three halfpence to one penny.



Revo "Paisley" standards fitted with "Whiteray" lanterns installed along the Morecambe promenade extensions

Southborough.—ELECTRICITY FOR PUMPING.—The Urban District Council has approached the Tunbridge Wells Town Council for an extension of the electricity mains to the pumping station, where electric pumps are to be installed.

South Africa.—JOHANNESBURG POWER STATION.—Mr. C. J. Spencer, resident director of the North-Metropolitan Electric Power Supply Co., Ltd., has written to the Administrator of the Transvaal suggesting that Mr. J. R. More and Professor S. H. Frankel, his colleagues on the recent Johannesburg transport inquiry commission, should meet him in London as soon as possible to discuss the report on the municipal power station, which formed the second part of the inquiry. Mr. Spencer was chairman of the Commission.

Stone.—LOANS.—The Urban District Council has decided to apply for sanction to the following loans: £2,500 for the proposed extension of supply to Aston and Little Stoke; £500 for unspecified plant; £10,000 for unspecified mains and services; and £1,000 for meters.

Surrey.—RESULT OF INQUIRY.—Following the inquiry held in September into the application of the Mid-Southern Utility Co. for permission to erect overhead lines in Compton, Puttenham and Seale, the Minister of Transport has approved overhead lines at Shoelands Lane, Seale. At the suggestion of the inspector, the Company is negotiating with landowners for the lines to be erected on private property in the case

Municipal Supply Undertakings' Results

Town.	Engineer.	Total Revenue.		Working Expenses.		Net Profit.		Sales of Electricity.		
								Thousands of kWh.		Percentage Increase.
		1933.	1934.	1933.	1934.	1933.	1934.	1933.	1934.	
		£	£	£	£	£	£			
Aberdeen	J. A. Bell	240,123	238,967	98,991	106,401	21,735	26,514	41,782	43,862	5.0
Bexhill	C. A. Frost	47,772	50,055	33,939	35,139	2,129	3,306	5,794	6,135	5.8
Bradford	T. Roles	611,581	647,767	373,447	483,287	24,712	21,885	111,731	117,964	5.6
Bridlington	A. J. Beckett	34,912	32,906	20,780	17,408	3,173	4,578	2,171	2,331	7.4
Bury	J. G. Potts	123,384	131,709	65,160	63,182	‡	8,519	28,910	30,619	5.9
Chester	S. E. Britton	114,035	125,446	66,018	76,056	3,717	2,650	14,121	16,406	16.1
Croydon	F. N. Rendell-Baker	423,333	466,206	185,911	219,449	36,011	41,765	105,388*	120,832*	14.6
Darwen	F. M. Fletcher	34,741	37,078	20,727	21,826	3,572	5,230	‡	‡	‡
Douglas	B. Kelly	43,284	49,334	20,271	24,525	610	1,794	2,445	3,010*	23.1
Eastbourne	J. K. Brydges	184,900	191,760	143,214	145,029	4,311	11,568	25,504	28,640	12.3
Epsom and Ewell	H. W. Watts	‡	50,624	‡	32,550	‡	2,403	‡	‡	‡
Gravesend	C. F. McInnes	‡	95,593	‡	49,796	‡	11,133	‡	28,079	‡
Great Yarmouth	P. E. Rycroft	130,147	146,767	50,233	51,323	11,413	20,250	17,908	22,020	22.9
Halifax	G. A. Vowles	202,210	207,050	101,777	139,720	32,770	21,843	37,390	41,185	10.1
Hastings	A. J. Ryan	168,006	185,620	150,080	122,473	17,925	7,141	25,874	30,710	18.7
Islington	A. P. MacAlister	360,089	371,503	265,027	265,447	45,942	54,525	39,306	42,921	9.2
King's Lynn	C. W. Jackson	43,607	51,072	20,638	20,989	5,972	6,049	5,599	7,001	24.8
Long Eaton	J. Barnett Feltham	36,481	38,655	‡	‡	1,116	2,239	4,466	5,242	17.4
Lytham St. Annes	J. C. Fairchild	79,578	84,012	45,737	46,960	4,201	7,424	8,518	9,037	6.1
Mountain Ash	E. W. Jones	21,542	21,340	15,228	17,009	53	3,521	1,678	1,837	9.4
Nelson	T. Dawson Martin	94,076	98,848	63,837	58,773	1,900	816	13,368	14,350	7.3
Norwich	V. A. Pask	285,035	305,537	157,379	173,612	25,252	34,794	45,875	51,248	11.7
Preston	J. F. Simpson	349,421	398,762	162,714	199,006	2,757	15,640	120,973*	158,284*	32.0
Southampton	W. G. Turner	307,315	332,982	151,824	152,213	20,970	41,813	47,466	57,360*	20.8
Spenborough	A. Pickersgill	‡	24,159	‡	14,888	‡	3,336	3,115	3,533	13.4
Stepney	A. E. Campbell	417,704	441,811	193,161	200,088	13,830	24,743	77,091	80,888	4.5
Stirling	W. R. Murray	22,559	22,027	16,106	16,878	1,374	877	2,573	2,835	10.1
Wallasey	B. T. Hawkins	189,728	202,017	99,895	111,363	33,401	32,391	57,833	46,777	19.1†
Warrington	F. V. L. Mathias	159,425	181,287	99,330	109,240	17,724	16,561	29,927	37,411	25.0
Watford	A. W. Barham	160,490	168,081	84,040	86,607	‡	23,167	39,353	40,541	3.0
Weymouth and Melcombe Regis	G. Nicolson	46,472	49,252	22,169	25,160	6,902	6,579	4,703	5,776	22.9
Winchester	R. Ayton	51,183	51,804	33,348	32,784	1,962	973	3,179	3,339	5.1

* Including supplies taken by Central Board. † Decrease due to cessation of bulk supply to Birkenhead. ‡ Figures not available.

of roads in Compton and Puttenham. The application was opposed by the County Council and the Guildford Rural District Council.

Sweden.—PROPOSED POWER STATION.—It is reported from Stockholm that the Waterfall Board is planning to construct a big hydro-electric station at the Stadsforsen rapids on the Indalsaelven river. The cost would be Kr.18,500,000, and the capacity 80,000 kW (about 500,000,000 kWh a year). Construction would not begin at once, the programme being kept in reserve for times when the need for more power is felt.—*Reuter's Trade Service.*

Tunbridge Wells.—LOAN.—The Town Council has received sanction to a loan of £4,500 for mains in connection with the bulk supply to the Tonbridge Rural District Council.

Wallsend.—CABLES.—The Town Council has approved plans submitted by the North-Eastern Electric Supply Co., Ltd., Newcastle, for the laying of cables in High Street and Frank Street, Wallsend.

Whitworth.—LOAN.—The Electricity Committee has decided to apply for a loan of £12,000 for unspecified expenditure during the next three years and for £2,579 for specified expenditure.

West Bromwich.—BULK-SUPPLY TARIFF.—The Electricity Committee recommends that the minimum amount of electricity under the bulk-supply tariff be reduced from 20,000 to 12,000 kWh per quarter as from October 1st last.

Wick.—UNDERTAKING'S FINANCES.—It was reported to the Town Council that the Chamberlain considered the electricity undertaking had a deficiency of £2,853 during the year to May 15th last. A report by Mr. G. N. Atkinson, the recently appointed manager, stated that careful analysis revealed that practically no single tariff was sufficiently remunerative in view of the exceptionally heavy capital expenditure with which the undertaking was burdened. In a letter regarding the Council's application for sanction to borrow a further £11,000 for the undertaking, the Electricity Commissioners pointed out various discrepancies in the report, such as amounts wrongly allocated and sums overspent on other items, and asked for an explanation. It was agreed to engage a chartered accountant to put the undertaking on a business footing.

Traction

Aberdeen.—PROFITABLE TRAMWAYS.—The 1933-34 annual report of the Transport Department has been sent to us by Mr. A. Smith, the general manager. It shows an increased revenue from the tramways of over £3,200, bringing the total amount to £151,617, while the working expenses (£112,795) are less by £2,936. The net result is a surplus of £8,607. The number of passengers carried increased from 37,571,351 to 38,256,224, and the car mileage from 2,524,218 to 2,593,165.

Belgium.—LIÉGE TROLLEY-BUSES.—The Société des Tramways Unifiés de Liége et Extensions, which has brought into service a large number of electric trolley-buses during the past three or four years, has recently constructed a special automatic transformer station to supply power to the overhead conductors in some of the hilly districts of the city. The trolley-buses are provided with current-regeneration apparatus. When an excess of recuperated current is generated it passes to the new automatic station, where it is converted to a.c. and supplied to the city's distribution network. *L'Electricité pour Tous* reports that the new station has already been visited by a number of experts interested in its special features.

London.—A NEW BILL.—The London Passenger Transport Board is promoting a Bill in Parliament to secure powers for a comprehensive scheme of works. It is proposed to establish trolley-bus services on approximately 58 miles of route in Hendon, Finchley, Wood Green, Hornsey, Tottenham, Walthamstow, Chingford, Leyton, Wanstead and Woodford, West Ham, East Ham and North Woolwich. An improvement scheme for the Metropolitan line provides for an extension of the electrified track as far as Amersham. It is proposed to provide two additional tracks between Rickmansworth and Harrow, and to reconstruct a number of stations on the Rickmansworth and Harrow lines; power will also be sought for the construction of a "Tube" railway connection between the Metropolitan line at Finchley Road and the Bakerloo line near Baker Street, so as to provide a through service of trains between the Metropolitan main line and the West End. Baker Street station will be largely reconstructed. A short branch is proposed at Uxbridge to a new station in the High Street. Another scheme is that Aldgate East station shall be re-sited at the junction of Commercial Road and Whitechapel Road. There is also a proposition to carry the "inner circle" at Cromwell Road, Kensington, under the "District" main line by means of a fly-under junction, so as to avoid fouling the main lines and to bring the line into the centre platforms at the South Kensington station.

L.N.E. Railway.—COLOURED-LIGHT SIGNALLING.—The L.N.E.R. Co. has authorised a scheme for the provision of coloured-light signalling between Bethnal Green and Hackney Downs. This is a continuation of the existing coloured-light signalling on the Enfield branch, and will also link up with the scheme which is nearing completion for a similar type of signalling between Hackney Downs and Clapton.

Manchester.—ELECTRIC TRUCKS.—Two electric trucks are being purchased by the Corporation for service at local hospitals.

Newcastle-upon-Tyne.—TRAMCAR HEATING.—The Corporation is experimenting with electric heaters on some of the tramcars.

Russia.—RAILWAY ELECTRIFICATION.—Over 600 km. of railways worked by electricity will be put into operation this year. Electrification work on the main and suburban lines covers a total length of 2,150 km, according to *Reuter's Trade Service.* About 5,000 km. of railways will be electrified by 1937. Sixty million roubles were spent on the electrification of railways under the first five-year plan. The estimated expenditure under the second plan amounts to 521 million roubles. A new type of electric engine for passenger trains has a maximum speed of 130 km. an hour. The first mile and a half of Moscow's "Underground" was tested recently when a two-coach electric train was run over the section. The object was to try out the power and signalling systems, which were proved to be satisfactory. This first stretch of the line to be finished is for the Sokolinki suburb, north-east of the city, to the Komsomolskaia (Kalanchevskaia) Square, where the three great terminal stations of the lines from Leningrad, Kazan and the north are situated.

Sweden.—UNDERGROUND RAILWAY.—A scheme is being promoted in Gothenburg for the construction of an underground railway connecting with local lines. The expenditure is estimated at 46,000,000 kr.

Traffic Signals are to be provided at the following places: Station Road, East Barnet (£814); Leigh Arms, Warrington; Huntingdon Street, St. Neots; Edgware Road, Hendon; Ruthin Road, Wrexham; High Street, Dorking; Great North Road, Newcastle.

Communications

Alsace.—STRASBOURG.—Experimental transmissions are shortly to be made at the Strasbourg broadcasting station on a power of 40 kW. At present 15 kW is used.

Devon.—SEA CABLES.—The Western Union Telegraph Co.'s cable ship, *Lord Kelvin*, has been experimenting with a special plough designed to bury submarine cables in the ocean bed. Tests in Bigbury Bay, off the Devon coast, we understand, have shown that it is possible to bury a cable in the bed at depths of 200 ft. Attempts made at a depth of 3,000 ft. in the Atlantic Ocean are also claimed to have been successful. Altogether 20 miles of cable is reported to have been laid 100 miles south-west of Ireland. So successfully was the cable buried that only once in twenty attempts were specially prepared grapnels able to pick up the cable.

Manchukuo.—COMMUNICATION PROGRESS.—The Manchuria Telephone & Telegraph Company, the organisation controlled by the Japanese and Manchukuo Governments, now owns 26,500 miles of telegraph circuits, and 39,500 miles of telephone circuits. Under its control are 515 telegraph offices, 337 telephone offices, 5 broadcasting stations, 23 fixed and 50 mobile wireless stations. In November the company's new 100-kW broadcasting station at Hsinking, will be opened, which has cost about 2,000,000 yen; most of the apparatus has been built by the Japan Electric Co. A short broadcast in English will be given every evening at 6 p.m.

Northern Ireland.—NEW REGIONAL STATION.—A new regional station is to be built by the B.B.C. at Lisburn, Co. Down.

Russia.—NEW RADIO STATIONS.—Two thousand new wireless stations are being set up on collective and State farms. They will form a network of radio stations, so that the different farm can keep in touch with one another and with headquarters at Moscow. One of the reasons for grain shortages in the past has been the difficulty of maintaining contact with grain-raising farms.—*Reuter* (Moscow).

Sweden.—TELEPHONE TIME.—Telephone subscribers in Stockholm have recently been provided with a new facility. They have merely to call up a certain number to be informed accurately and automatically what the time is to the nearest ten seconds. The installation has been devised by the L. M. Ericsson Telephone Co., and it comprises an electrically controlled clock and a gramophone with records actuated by light cells. When the automatic telephone has put the subscriber in connection with "Froken Ur" (Miss Clock) lights shine on three records at the places of the hour, the minute, and the tenth second. The gramophone loudspeaker then reproduces the numbers in their right order. Thus, if the time is 14 minutes and 23 seconds past 6 in the evening the voice will say 18.14.20. There is no charge for this service, though the call is counted as one of the number allowed for by the telephone subscription.

Switzerland.—SOTTENS.—We understand that Radio Suisse Romande, Sottens, will cease transmissions for several weeks, early in 1935, while work is carried out in connection with the increase in power from 25 to 50 kW.

West Africa.—BROADCASTING.—Mr. Byron, the broadcasting officer at Sierra Leone, is visiting the Gold Coast to make preliminary investigations in connection with the establishment of a broadcasting service in that colony. A start will be made at Accra, and later the service is to be extended to Kumasi, Sekondi and Cape Coast.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Eeview" containing the advertisement is given in parentheses below

Contracts Open

Aldershot.—November 10th. Electricity Department. Meters (November 2nd.)

Australia.—MELBOURNE.—State Electricity Commission of Victoria. December 10th. Oil-insulated transformers. (A.Y. 12719.)* 6,600-V compound-filled circuit-breaker unit and accessories. (A.Y. 12700.)*

Posts and Telegraphs Department. December 18th. Automatic telephone switching equipment. (A.Y. 12663.)* Telephone switchboard lamps, lamp-caps and sockets. (A.Y. 12731.)* Multiple-twin l.c. telephone cable. (A.Y. 12744.)*

December 11th. Telephone switchboard keys of various types and accessories. (A.Y. 12712.)* Resistance and reactance spools and coils. (A.Y. 12709.)* Motor-generators and rectifiers of various types. (A.Y. 12733.)*

SYDNEY.—Municipal Council. December 17th. 33,000-V and 11,000-V switchgear. (A.Y. 12703.)*

January 7th. Automatic boiler control equipment for three boilers at the Bunnerong power station. (A.Y. 12737.)*

BRISBANE.—January 25th. City Council. One 18,750-kW steam driven turbo-alternator, together with cooling equipment, piping, &c. (A.Y. 12741.)*

Barking.—November 12th. Electricity Department. L.p. cable. (November 2nd.)

Beckenham.—November 19th. U.D.C. Steel lamp columns. (See this issue.)

Blackpool.—November 20th. Corporation. Eight 300-kVA, fifteen 150-kVA and three 400-kVA transformers. (November 2nd.)

Cranbrook.—November 12th. Cranbrook and Tenterden Joint Hospital Board. Electric lighting installation in three hospital blocks. Particulars from clerk to the board.

Ealing.—November 20th. Electricity Department. 11,000-V and 660-V metal-clad switchgear, and 660-V distribution fuse boards. (November 2nd.)

Egypt.—KHARTOUM.—December 13th. Public Works. Ministry in the Sudan. Electrical wiring materials for workshops at Gordon's Tree Dockyard. (A.Y. 12706.)*

Hastings.—November 29th. Electricity Department. Materials for the year commencing January 1st, 1935. (October 26th.)

India.—NEW DELHI.—November 26th. Stores Department. Flameproof v.i.r. cable. (A.Y. 12717.)*

Kilkenny.—November 17th. Commissioner of the District Mental Hospital. Electrical installation and subsidiary services at the hospital. Specifications from J. P. Tierney & Co., 44, Kildare Street, Dublin (deposit £5 5s.); tenders to P. J. Cassin, resident medical superintendent, District Mental Hospital.

London.—November 27th. Metropolitan Water Board. Overhaul and repair of lighting and power installation at the head offices of the Board. (See this issue.)

Manchester.—November 19th. Electricity Committee. Water-cooling towers for Stuart Street power station. (November 2nd.)

Moffat.—November 10th. Town Council. Various works, including electrical, at housing scheme. Schedules from, and tenders to, town clerk.

Morocco.—RABAT.—December 27th. Posts and Telegraphs Department. Telephone cable. (A.Y. 12756.)*

New Zealand.—CHRISTCHURCH.—Electricity Department. January 15th. Metal-clad switchgear. (A.Y. 12723.)*

WELLINGTON.—Posts and Telegraphs Department. January 9th. Telephone dials, impulse wheels, &c. (A.Y. 12752.)*

January 21st. 100 microtelephone set cases and 100 microphone transformers. (A.Y. 12754.)*

January 24th. Telephone headgear receivers. (A.Y. 12753.)*

January 29th. Telephone instrument and switchboard cords. (A.Y. 12750.)*

Northampton.—November 10th. Transport Committee. 365 to 400-V, 3-phase, 50-cycle motors. (October 26th.)

Oldham.—November 17th. Electricity Committee. L.p. cable. (November 2nd.)

Peebles.—November 20th. County Council. Various works, including electrical alterations and additions to Kingsland House. Schedules from Dick Peddie & Walker Todd, architects, 8, Albyn Place, Edinburgh (deposit £1); tenders to joint county clerks.

Portsmouth.—November 21st. Corporation. P.i. and rubber-insulated cable for six months ending June 30th, 1935. (See this issue.)

Rochdale.—November 21st. Electricity Department. Ten 300-A switch cubicles for Dane Street power station. (See this issue.)

Southend-on-Sea.—December 6th. Electricity Department. Two alternators and switchgear. (November 2nd.)

Stoke-on-Trent.—November 14th. Electricity Department. Electric cookers. (November 2nd.)

Walsall.—November 13th. Electricity Department. Electrical material, &c., for one year from January 1st, 1935. (October 26th.)

West Ham.—November 26th. Electricity Department. Coal and p.i. cables for twelve months ending December 31st. (See this issue.)

Weymouth and Melcombe Regis.—November 22nd. Corporation. Cable and feeder pillars. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Burnley.—Electricity Committee. Accepted. Transformers required for supplies to the Municipal College and Enfield Brick and Terra Cotta Co. (£390).—Metropolitan-Vickers Electrical Co., Ltd.

Dalkeith.—Town Council. Accepted. Wiring 148 houses on the Woodburn estate (£673).—A. J. Shand.

Dewsbury.—Town Council. Accepted. Wiring 104 houses for electric lighting (£394).—W. Angus.

Durham.—County Council. Accepted. Traffic signals: Bishop Auckland (£148).—J. H. Holmes & Co., Ltd.; New Herrington (£385).—Automatic Electric Co., Ltd.

Education Committee. Accepted. Electric lighting at Hurworth School (£159).—T. B. Watson & Son, Ltd.

Edgware.—Middlesex C.C. Recommended. Internal telephone installation at Red Hill institution (£195).—Siemens Schuckert (Gt. Britain), Ltd.

London.—ST. MARYLEBONE.—L.C.C. Accepted. Electrical installation at Poor Law institution (£575).—D. Myer & Co. This was the lowest of twelve tenders, thé highest being £790.

WOOLWICH.—L.C.C. Assistance Committee. Accepted. Installation of fire alarm system at Poor Law institution (£542).—Phillips & Sons (Electrical), Ltd.

L.C.C.—Hospitals and Medical Services Committee. Accepted. Improvement of electric lighting at the City of London Institution, Bow (£296).—J. Briggs, Electrical Contractors. Ltd. Various electrical works at the following buildings:—Constance Road institution, East Dulwich (£767).—Buchanan & Curwen, Ltd. Fulham Hospital (£353), Lambeth Hospital (£1,343), St. Luke's Hospital and Chelsea Institution (£574).—Samuel Reed & Sons. New End Hospital, Hampstead (£1,786).—Anderson, Angell & Co., Ltd. Paddington Hospital (£1,328).—Harland & Wolff, Ltd. St. George-in-the-East Hospital, Wapping (£1,207).—W. J. Furse & Co. (London), Ltd. St. Giles' Hospital, Camberwell (£2,213).—G. E. Taylor & Co. St. James' Hospital, Balham (£1,698).—A. Hawkins & Sons. St. Leonard's Hospital, Shoreditch (£1,232).—L. G. Tate & Co., Ltd. St. Peter's Hospital, Whitechapel (£650).—F. G. Edey & Co., Ltd. Electric lifts at Fulham, New End (Hampstead), Paddington, and St. Mary Abbotts (Kensington) Hospitals (£3,130), St. Luke's, Lowestoft, and St. Nicholas, Plumstead, Hospitals (£1,950).—J. & E. Hall, Ltd. Alterations to lighting and installation of automatic telephone system at Pinewood Sanatorium, Wokingham (£1,493).—Read & Partners. Fire alarm systems: St. Andrew's Hospital, Bow (£327).—A. Meckhonik; St. Nicholas Hospital, Plumstead, and Woolwich Institution (£542).—Phillips & Sons (Electrical), Ltd. Electrical installations at Northern Hospital, Winchmore Hill (£910).—A. Cozens.

Middlesex.—Health Committee. Recommended. Replacements of lifts at North Middlesex county hospital (£2,024).—Hammond & Champness, Ltd.

Whitehaven.—Rural Council. Accepted. Wiring seventy-eight houses at Moresby Park (£350).—E. Simpson.

Forthcoming Events

Bristol Electric Club.—Friday, November 9th. Royal Hotel, Bristol. 7.45 p.m. Address by Mr. F. Little.

Electrical Association for Women.—Monday to Friday, November 12th to 16th. 20, Regent Street, S.W.1. Exhibition and conference. "Electricity for the Working Woman."

Illuminating Engineering Society.—Tuesday, November 13th. Hall of the Institution of Mechanical Engineers, S.W.1. 7 p.m. "Industrial Lighting: Some Problems in Sheffield and Their Solution." Mr. R. W. Daniel.

Association of Supervising Electrical Engineers.—Wednesday, November 14th. Magnet House, W.C.2. "Communication, Protection and Supervisory Control Systems for Electric Power Networks." Mr. N. C. Smart.

Institution of Welding Engineers.—Wednesday, November 14th. Municipal Technical College, Oldham. 7.15 p.m. "Metallic Arc Welding." Mr. W. L. McIvor.

Electrical Trades' Commercial Travellers' Association.—Friday, November 16th. Criterion Restaurant, W.1. 6.30 for 7 p.m. Annual dinner dance

Junior Institution of Engineers.—Friday, November 16th. 39, Victoria Street, S.W.1. 7.30 p.m. Informal meeting. "High Pressure Boilers." Mr. J. Calderwood.

Midland Electrical Engineers' Ball.—Friday, November 16th. Grand Hotel, Birmingham.

Institution of Electrical Engineers.—Monday, November 12th. Institution, London. 7 p.m. Informal meeting. Discussion on "The Efficient Use of Distribution Capital." Opened by Mr. J. M. Kennedy. (*North-Eastern Students' Section*).—Saturday, November 10th. Visit to the Gosforth electric car shed, Newcastle. Friday, November 16th. Armstrong College, Newcastle. 7.15 p.m. "Earthquakes, Sun-Spots and Other Disturbances of Radio." Mr. J. F. M. Mellor. (*North Midland Students' Section*).—Saturday, November 10th. Visit to the Fryston Pit of Airedale Collieries, Ltd. Tuesday, November 13th. Hotel Metropole, Leeds. 7.15 p.m. "Development in the Materials of Construction of Electrical Plant and Apparatus—Magnetic, Insulating, Conducting and Mechanical." Mr. A. P. M. Fleming. (*North-Eastern Centre*).—Monday, November 12th. Armstrong College, Newcastle. 7 p.m. "The Application of a Gas-Cooled Arc to Current Conversion." Mr. W. G. Thompson. (*East Midland Sub-Centre*).—Tuesday, November 13th. The College, Loughborough. 6.45 p.m. Joint meeting with the Institution of Mechanical Engineers and the Institute of Fuel. "The Peak Load Problem and Peak Load Diesel-

Engined Stations." Mr. G. Porter. (*Mersey and North Wales (Liverpool) Centre Students' Section*).—Tuesday, November 13th. The University, Liverpool. 7.30 p.m. "Modern Street Lighting." Mr. C. C. Paterson. (*North-Western Students' Section*).—Tuesday, November 13th. Engineers' Club, Manchester. 7.15 p.m. "Electrical Equipments on Single-phase Locomotives." Mr. P. B. Mckenzie. (*Scottish Centre*).—Tuesday, November 13th. Engineers' Rooms, 39, Elmbank Crescent, Glasgow. 7.30 p.m. "Hydro-Electric Development in Great Britain." Messrs. A. S. Valentine and E. M. Bergstrom. (*South Midland Students' Section*).—Tuesday, November 13th. James Watt Memorial Institute, Birmingham. 7 p.m. "Calculation of Electro-Mechanical Forces." Mr. G. L. E. Metz. (*Hampshire Sub-Centre*).—Wednesday, November 14th. Municipal College, Portsmouth. 7.30 p.m. "A Velocity-Modulation Television System." Messrs. L. H. Bedford and O. S. Puckle. (*Irish Centre (Dublin)*).—Thursday, November 15th. Trinity College, Dublin. 6 p.m. "A Critical Examination of the Present Practice Relating to the Electrical Warming and Air Conditioning of, and the Supply of Hot Water to, the Larger Buildings." Messrs. R. Grierson and D. Betts. (*Meter and Instrument Section*).—Friday, November 16th. Pagani's Restaurant, W.1. 6.45 for 7 p.m. Annual dinner.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, November 17th. Cardiff. "Some Aspects of Underground Lighting." Mr. W. Davies.

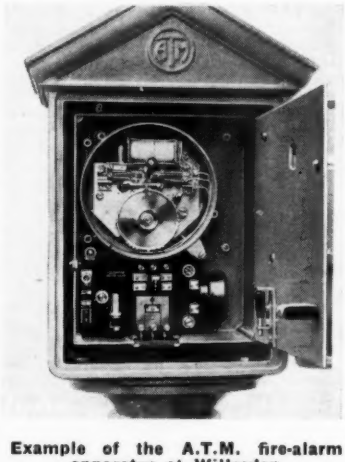
Notes

The National Electrical Convention 1935

In a letter dated November 6th, Mr. J. W. Simpson, the secretary of the I.M.E.A., who is acting as general secretary of this Convention, says that circumstances have arisen which have necessitated the alteration of the venue and date of the Convention, and it has now been arranged that it shall be held at Bournemouth from May 27th to June 1st. Further particulars regarding the programme will be available in the near future.

The Willesden Fire Alarm System

The A.T.M. closed-circuit fire-alarm system has been adopted in connection with the new central fire station at Willesden, which was formally opened on November 3rd. The system comprises a series of closed loops (rented from the Post Office) connecting the calling points with the central alarm. A break in the loop circuit is automatically indicated at the sub-station and causes one pole of the battery to be earthed, thus utilising the earth as a temporary return.



Example of the A.T.M. fire-alarm apparatus at Willesden

The present installation consists of seventy-six points in the Cricklewood area connected with three sub-stations. In addition to the alarm at each sub-station, there is a repeating apparatus at the central station where every call is received simultaneously with the call to the sub-station. Each call box is in telegraphic and telephonic communication with headquarters and with other boxes. Duplicate batteries provide current for the loops at each sub-station, and for the three repeating loops at the central station.

The Batti-Wallahs' Society

The monthly luncheon of the Society took place at the Hotel Metropole on November 6th, under the presidency of Mr. W. E. Highfield. The chief guest was Sir R. Burton Chadwick, who spoke of the mercantile marine, more particularly its personnel, which was so completely invisible and inarticulate that its true worth was not appreciated. He considered it to be the duty of everyone to stress strongly the importance of shipping and aircraft to this island country of ours. Mr. G. W. Partridge proposed a vote of thanks.

The E.A.W.

The Mayor and Mayoress of Preston were guests at a luncheon which preceded the annual conference of the Electrical Association for Women at Preston on October 31st. The Mayor said the newest estates were mostly all-electric; 8,000 electric cookers, 4,000 electric wash-boilers, 30,000 electric fires, and 20,000 electric irons were used in the Preston area. Mrs. M. M. Hutchinson, secretary of the Farnworth district branch and chairman of the North-Western Area, presided, supported by Sir William Ray and Mr. C. D. Taite (Lancashire Electric Power Co.).

New Boiler Plant at Hams Hall

In our issue of October 19th we gave some particulars of the extensions projected at Hams Hall power station, Birmingham. The additional boiler plant falls into two sections—three powdered-fuel fired boilers and two stoker-fired boilers. The three International Combustion, Ltd.'s p.f. boilers will be rated at 250,000 lb. per hr. normal load and 300,000 lb. for two hours. Steam conditions at the boiler stop valve will be similar to those of the existing boilers, viz., 375 lb. per sq. in., and 730 deg. F., with a feed-water temperature of 300 deg. F. They are to be of the three-drum "Lopulco" design with vertical tubes, having, in addition, a superimposed steam receiver and a header drum to feed the water-cooled combustion chamber. Murray fin tubes will be included in the side and rear walls, but spaced tubes will be arranged on the front wall shaped to follow the contour of the burners and covering as much refractory as possible. A water screen of spaced bare tubes will cover the ash hopper.

The superheaters, of the M.L.S. interdeck type, between the first and second passes are to have a heating surface of 7,050 sq. ft. No economisers are to be installed, but an "Usco" air preheater (48,000 sq. ft.) in twin units will reduce the leaving gas temperature to 290 deg. F. on normal load.

The two stoker-fired boilers are to be of the same capacity, and will be fitted with "Usco" travelling chain grate "L" type stokers, 31 ft. in width by 20 ft. in length, supplied with preheated air. The five new boilers will be placed in line with the present five 228,000 lb. Lopulco p.f. boilers.

The Faraday House Dinner

The twenty-sixth annual dinner of the Faraday House Old Students' Association was held on November 2nd at the Savoy Hotel, London, W.C.2, with the president of the Association, Mr. M. D. Cloran (of the English Electric Co.), in the chair. The first toast, "Faraday House and its Old Students," was proposed by Mr. W. B. Woodhouse. Referring to the talk about the reorganisation of electricity supply, he urged that those engaged in it and with experience of its difficulties should be taken into counsel. He concluded with a warm eulogy of the work of Dr. Alexander Russell, principal of Faraday House, in turning out the right kind of men for the industry. Responding, Dr. Russell announced that the annexe to the College would be opened next May and would provide more adequate accommodation for the 400 students now enrolled. During the past year 167 students had obtained posts, while many of the older ex-Faradians secured positions of high responsibility. In proposing the health of "The Guests," Lord Rothes referred to the presence that evening of nine past-presidents of the Institution of Electrical Engineers, four of whom were old Faradians. Sir Richard Redmayne (president-elect, Inst.C.E.), Lord Greenwood and Mr. A. E. L. Chorlton responded. A speech of thanks to the chairman was made by Mr. G. W. Partridge.

A N.E. Coast Reunion

A reunion dinner was held at the Grand Hotel, Middlesbrough, on November 2nd, when sixty-five ex-members of staff of the former Cleveland and Durham Electric Power Co. gathered from all parts of the country (which included many of the pioneers of electric power supply). Many of them had not met for over twenty years. The chair was occupied by Mr. J. R. Beard, and a presentation was made by Mr. H. W. Sewell to Mr. A. H. Marshall, formerly chief engineer of the company, on his retirement from the North-Eastern Electric Supply Co. A most enjoyable evening was spent, the musical items being contributed entirely by ex-members of the staff.

Fatality

The death occurred on October 31st of Gerald St. Maur Mills, a switchboard attendant at the Grimsby Corporation electricity works. At the inquest held on Friday last Mr. A. C. Channon, station superintendent of the works, said that he was in the engine room when he was called to another part of the room where he found Mills being attended to by first-aid men. He was unconscious. The deceased was a switchboard attendant and about that time he would be attending to the switches governing a rotary convertor which supplied the traction services of the town. Dr. Granville Chapman said death was due to shock caused by an electrical discharge. There were burns on the thumb and finger of each hand which suggested that he had grasped something. The jury returned a verdict to the effect that Mills had died from electric shock, and considered that no one was to blame.

The London Chamber of Commerce

In the description of the new London Chamber of Commerce building in our last issue it was stated that Tucker bronze flush switches had been used. We are informed that the switches were of "Wandsworth" make, in adjustable grid boxes, supplied by the Wandsworth Electrical Manufacturing Co., Ltd.

Appointments Vacant

Chief assistant for the Plymouth Corporation electricity undertaking (£700 per annum).

Charge engineer for Bedford Electricity Department.

(See our classified advertisements.)

Makers' Names Wanted

LAN-BAR towel airer.

ISOLIT 2-pin bakelite flush plugs.

Flashing arrow electric sign.

GREAT UNIVERSAL bowl fire.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

More than once rumour has been busy with regard to the future of **Sir Andrew Duncan,** chairman of the Central Electricity Board. This time it almost looks as though there might be something in it. The *Daily Telegraph* "Industrial Correspondent" on Tuesday stated that Sir Andrew is likely to be appointed to be the new independent chairman of the whole iron and steel industry when the executive committee of the British Iron and Steel Federation meets on November 15th to decide the appointment, which will be for several years and will carry a salary of £8,000 per annum. According to our contemporary, the president, Mr. James Henderson, and the director, Sir William Larke, will continue in office. The view of the committee is that the Federation needs someone from outside the industry to adjudicate upon conflicting interests as and when they arise.

Mr. A. Aspinall, the borough electrical engineer of Brighouse, was presented with a framed photograph of the members of the Electricity Committee at a dinner given recently by Ald. J. H. Turner, chairman of the Committee, to mark the twenty-fifth anniversary of the opening of the transformer station in Huddersfield Road, Brighouse. Among those present was Mr. R. A. Thwaites, of the Yorkshire Electric Power Co., from whom Brighouse takes a supply of electricity in bulk.

Mr. J. Ireland, M.C., B.Sc., has been appointed general manager of the Salford and Trafford Park undertakings of the London Electric Wire Co. and Smiths, Ltd., as from November 1st. Mr. Ireland was previously managing director of Monel-Weir, Ltd., Glasgow, prior to the merger of that firm with Messrs. Henry Wiggin & Co., Ltd., Birmingham, two years ago, when he was appointed joint sales manager of the latter company.

Mr. J. Ireland

Mr. F. G. Penny, chief engineer and general manager of the Derby works of International Combustion, Ltd., has been appointed a special director of the company. He is an authority on the subject of combustion and boiler design and operation, and has had extensive experience both at home and abroad.

Mr. J. Carnegie, A.M.I.E.E., has been appointed to the position of sub-station superintendent to the Poplar Borough Electricity Department. Mr. Carnegie served his apprenticeship with the Metropolitan-Vickers Electrical Co., and thereafter joined the technical staff of the Glasgow Corporation Electricity Department, where he has been during the past eleven years. Mr. Carnegie has been prominently connected with the activities of the Electrical Power Engineers' Association in Scotland.

Mr. W. G. Ward, B.Sc., A.M.Inst.C.E., has recently been appointed manager and engineer of the Ndola and Lusaka electricity and water undertakings of the Northern Rhodesian Government, in succession to **Mr. D. W. V. Ellis,** who has resigned. According to *East Africa*, Mr. Ward is taking up his duties immediately, and will live in Lusaka, so that he can supervise the installation of the electricity scheme for the new capital.

Mr. J. Taylor, A.M.I.E.E., mains tcehnical assistant with the Sheffield Corporation Electricity Department, has been selected from 130 applicants for the position of mains engineer to the Cleethorpes electricity undertaking. Mr. Taylor was previously assistant mains engineer at Walsall, and served his articles under Mr. P. P. Wheelwright at Blackburn.

Coun. W. Bird, a director of the Engineering & Lighting Equipment Co., Ltd., has accepted the mayoralty of St. Albans. He became a member of the City Council in 1932.

Mr. G. B. Wood has been appointed sole agent for Scotland for Messrs. Jackson & Kenrick, Ltd., of Lye, near Stourbridge. His address is 141, Bath Street, Glasgow, C.2.

Among the awards made by the Council of the Junior Institution of Engineers for papers read during the past session are the following: The Institution gold medal to Mr. J. Rosen for his paper, "High Voltage Alternators"; the Midland Section silver medal to Mr. C. E. Ward for his paper, "Industrial Electric Heating"; the North-Western Section silver medal to Mr. F. E. Bancroft for his paper, "Continuously Evacuated High Vacuum Electrical Plant"; and the North-Eastern Section silver medal to Mr. T. H. Carr for his paper, "Electrical Equipment of Power Stations."

Mr. H. W. Barber, district manager of Messrs. Johnson & Phillips, Ltd., has been returned for the third time unopposed to the Southport Town Council. Mr. Barber is a member of the Electricity Committee.

Mr. V. C. Hook, late of the Times Electrical Co., Ltd., has joined the staff of the J.B. Electrical Co., Ltd.

Mr. E. A. Newburn, mains superintendent of the Walsall Corporation Electric Supply Department, has been recommended by the Electricity Committee for the position of manager of the electricity undertaking at a salary of £800 per annum, rising to £1,100.

Mr. A. W. Moore, who was many years with the Edison Swan Electric Co., Ltd., has joined the Piggott Electrical Co., Ltd.

Obituary

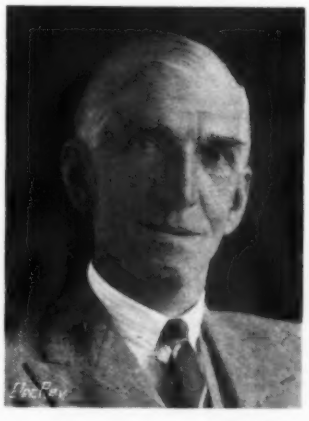
Mr. E. Cordrey.—News of the death of Mr. Edward Cordrey, of Manchester, will be received with regret by a large circle of friends in the electrical industry. He was proprietor of Messrs. Underwood (Manchester), Ltd., which company has been established for twenty-six years in Manchester as a wholesale distributor of electrical materials. Mr. Cordrey was fifty-eight years of age.

The late Mr. E. Cordrey

Mr. A. F. Murtz, manager of the Osram lamp stores of the General Electric Co., Ltd., died suddenly on November 1st at the age of fifty-four. Mr. Murtz had completed twenty-five years' service with the company.

Mr. A. B. Mountain.—The death occurred at Salcombe on October 19th of Mr. Arthur Barnes Mountain, consulting electrical engineer, at the age of sixty-eight. Mr. Mountain received his training in the works of his father, who carried on business as Mountain & Sons, engineers, Birmingham, and in the engineering department of the Coalbrookdale Co. In 1889 he became chief assistant engineer to the Newcastle Electric Supply Co., with whom he remained until 1891, when he was appointed by the Huddersfield Corporation to erect its power station, where he remained as chief of the undertaking for many years, acting also as consulting engineer to a number of local authorities, for whom he installed electricity supply systems. He will be remembered by our older readers as one of the presidents of the Incorporated Municipal Electrical Association and as chairman of the Leeds Section of the I.E.E., before which, as long ago as the year 1903, he read an exhaustive paper on electricity supply for small towns and villages, a subject on which he was an authority.

Mr. A. A. Lister.—Mr. Austin Ashton Lister, chairman of Messrs. R. A. Lister & Co., Ltd., of Dursley, Glos., died last week. He was the third son of the late Sir Ashton Lister, the founder of the firm, whom he succeeded as chairman when Sir Ashton died in 1929. The deceased gentleman had travelled extensively abroad on behalf of the company. His life had been spent in its service, and among other achievements to his credit are the founding in Canada of a subsidiary Lister company which he managed for some years. He was a director of a number of other companies and was well known in the engineering industries. He leaves a widow and two children.



[*Lafayette.*

The late Mr. A. A. Lister

Wills.—Brig.-Gen. C. H. Whittington, a director of Messrs. Mather & Platt, left £33,944 (net personalty £33,371).

Mr. J. T. Mould, a director of the Igranic Electric Co., Ltd., left £13,894 (net personalty £12,979).

Mr. A. W. Hibberdine, general manager (communications) of Cables & Wireless, left £7,908 (net personalty £6,783).

The Late Mr. Theodor Petersen

WE deeply regret to record that Mr. Theodor Petersen, M.I.E.E., Callender's Cable & Construction Co., Ltd., died on Friday last at his home, The Lea, Esher, Surrey.

Mr. Petersen, who was sixty-five years of age, was one of the best known business men in the electrical industry and his death deprives a very large number of engineers of a personal friend. He died in harness, after a brief illness, as only nine days before his death he did a heavy day's work in his office at Callender's.

He was the eldest son of Mr. T. W. Petersen, the Danish Consul at Birmingham, where he was born in 1869. After completing his education at Clifton College, he served his engineering apprenticeship with Messrs. Marshall's, of Gainsborough, later was for a time on the staff of the Brush Electrical Engineering Co., and was subsequently assistant engineer to the original Bournemouth and District Electric Supply Co., Ltd., for which he had to do with overhead mains and, incidentally, nearly met an early death by falling from the top of one of the wooden poles. Mr. Petersen's next work was in Denmark, and it was while there early in 1895 that he applied for and received from Mr. Tom Callender the post of assistant manager to Callender's Bitumen Telegraph and Waterproof Co.

The late Mr. T. Petersen, assistant managing director of Callender's Cable & Construction Co., Ltd.

His organising ability and work were fully recognised by Sir Tom Callender, and engineers found that he was always the man to see if Sir Tom was not available. In 1905 he was made a member of the Institution of Electrical Engineers, and was also appointed joint manager of the Anchor Cable Co., at Leigh, Lancs. Twenty-five years later he was appointed assistant managing director of Callender's Cable & Construction Co., and a director of the Anchor Cable Co., an occasion which was celebrated by the staff at a dinner at the Waldorf Hotel in July, 1931. He was then presented with his portrait in oils and an illuminated album. Mr. Petersen was also a director of the St. Helen's Cable Co., Ltd., the Kalbitum Paint Co., Ltd., and the Bungay Gas & Electric Light Co., Ltd.

Those who have been closely in touch with him hold it no exaggeration to say that the commercial success of all British cable manufacturing companies is largely due to Mr. Petersen's organising ability and his power of making friends. Most of our readers are familiar with the fact that the financial stability of these companies is one of the outstanding facts in British electrical manufacturing.

Mr. Petersen married Miss Florence Marshall, the daughter of the managing director of the firm with which he served his time. His only son is manager of Callender's Foreign Department, and he had four daughters, all of whom survive him. On our own behalf and also on behalf of a host of his friends and admirers, we wish to express deep sympathy with his widow and family.

Writing of the late Mr. Petersen, as one who had to do with him for years as a consulting engineer, Mr. R. W. Weekes says:—"I was always sure of having all the technical knowledge of Callender's expert staff placed at my disposal. I was also sure that I should have a square deal and no dispute over extras when settling accounts. Behind the business life I felt with a host of others that one was dealing rather with a business friend than with a contractor. Mr. Petersen also had the power of controlling a large staff without friction and of imbuing them with the same high business standards as he adopted himself in all his dealings. No doubt he learnt this high standard of business etiquette from his Chief, Sir Tom Callender, who always insisted that disputes, if any, were to take place before the contract was signed. So passes away another pioneer who has seen the electrical industry grow from the country house installation through the period of small pioneering companies and municipal undertakings to the Central Electricity Board with its network of high-pressure mains throughout the country. Mr. Petersen will be very greatly missed.

The funeral took place on Monday, the service at Esher Parish Church being conducted by the Rev. E. A. Hone, the rector. The family mourners were:—

Colonel and Mrs. E. P. Cawston, Mrs. J. Elston, Miss Petersen, and Mr. and Mrs. Richard Eglington (sons-in-law and daughters), Mr. G. H. T. Petersen (son), Mr. Roberts Petersen (brother), Mr. and Mrs. Gus Petersen, and Miss June Petersen.

Sir Thomas Callender (managing director of Callender's) was present with the following directors: Sir Malcolm Fraser, Major-General Sir Frederick Sykes, Mr. Tom Callender, Mr. P. V. Hunter, Mr. Charles Pipkin, Mr. Harold Fortescue Flannery, and Mr. W. G. Hendrey (advisory directors), and Mr. Howard Foulds (secretary), and Mr. E. M. Malek. Others present included: Mr. D. Johnston Sinclair and Mr. H. D. Roberts (B.I. Cables), Mr. Martin Harvey (Macintosh Cable Co.), Sir Montague Hughman (chairman, Henley's), Mr. W. F. Bishop (managing director, Henley's), Mr. F. Plutte (Enfield Cable Co.), Mr. J. S. Huddleston (Union Cable Co.), Mr. L. B. Atkinson (Cable Makers' Association), Mr. S. Warburg (Associated Contracts), Mrs. Swyer (Electrical Association for Women), Mr. W. C. Knights (colliery engineer of Callender's), Mr. J. S. McCallun (representative for Scotland), Mr. C. W. Clarke, Mr. B. W. Burrow, Mr. V. T. Burchall, Mr. R. A. Chattock, Mr. W. Lang, Mr. W. F. Slater and Mr. H. Hill (works managers at Erith), Mr. John Bowyer (manager, Leigh), and about three hundred of the employés and staff.

Sir J. Fortescue Flannery, Bt., the chairman of Callender's Co., was prevented from attending the funeral owing to the illness of Lady Flannery.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

The General Cable Manufacturing Co, Ltd.—Public company. Registered November 1st. Nominal capital, £150,000 in 150,000 6 per cent. cumulative preferred shares of 10s. each and 300,000 ordinary shares of 5s. each. The preference shares confer no votes except under special circumstances. Objects: To acquire the business of cable manufacturers, factors, dealers and agents, carried on by a company of the same name, and to carry on the business of manufacturers of and dealers in electric cables and wires and railway, tramway, electrical and other apparatus, manufacturers of bitumen, india-rubber, gutta-percha and waterproofing materials, &c. The directors are: C. W. R. Pantlin, 59, Portland Court, W.1, chairman; E. G. Bisseker, 1, Balderton Street, W.1; and Sir Joseph W. L. Napier, Bt., 25, South Street, S.W.7 (all directors of F. McNeill & Co., Ltd.), and J. Wright, Capel House, near Leatherhead (director of the General Cable Manufacturing Co., Ltd.). Registered office: 52, Russell Square, W.C.1.

The Metropolitan-Cammell Carriage and Wagon Co., Ltd.—Private company. Registered October 31st. Nominal capital, £1,000,308 in £1 shares. Objects: To acquire all or part of the assets, liabilities and undertaking of the Metropolitan-Cammell Carriage Wagon & Finance Co., Ltd. (in liquidation), to adopt an agreement between that company and its liquidator of the first part, this company of the second part, and Vickers, Ltd., and Cammell Laird & Co., Ltd., of the third part, and to carry on in Great Britain or elsewhere the business of manufacturers of and dealers in engines, carriages, wagons and rolling stock for railway, tramway, road or other traffic, engineers, carriers, shippers, timber merchants, &c. The first directors are: Col. John B. Neilson and Sir Charles W. Craven (appointed by Vickers, Ltd., as holders of 500,000 shares), and William L. Hichens (appointed by Cammell Laird & Co., Ltd., as holders of 500,000 shares). The directors shall, on the formation of the company, create £1,500,000 6 per cent. debenture stock of which £1,000,000 shall be issued to Vickers, Ltd., for cash and the balance of £500,000 retained for issue as collateral security. The directors may, from time to time, appoint any manager or other officer of the company to be special director. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.

Holts Washing Appliances, Ltd.—Private company. Registered October 29th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in washboilers, cookers and other appliances, electrical or otherwise, &c. The first directors are: W. Holt, 78, Lockyer Avenue, Burnley; and T. Holt, 91, Rectory Road, Burnley. Registered office: Central Chambers, Market Street, Nelson.

Dunmore Electric Light Co., Ltd.—Private company. Registered in Dublin October 31st. Capital, £1,200 in £1 shares. Objects: To carry on at Dunmore, Co. Galway, and elsewhere the business of an electric light company, &c. The directors are: J. Banks, 9, Clare Street, Dublin, and three others.

Westminster Chassis Co., Ltd.—Private company. Registered October 30th. Capital, £100 in £1 shares (50 6 per cent. cumulative preference and 50 ordinary). Objects: To manufacture, buy, sell and turn to account wireless receivers, transmitters, resistances, batteries, accumulators, aerials, components and fittings, &c. The life directors are: H. N. Weldon, 23, Westminster Palace Gardens, Victoria Street, S.W.1, and two others. Secretary: H. N. Weldon.

Eca-Ray Sales, Ltd.—Private company. Registered November 3rd. Capital, £3,000 in £1 shares (1,500 ordinary and 1,500 5 per cent. cumulative preference). Objects: To acquire the business of electrical distributors and salesmen carried on by Ernest Langrish and Horace Tilsley as Eca-Ray Sales. The first directors are: H. Tilsley, 20, Lovelace Road, Surbiton, Surrey, and E. Langrish, 247, South Park Road, Wimbledon, S.W. Registered office: 3, Sandland Street, Holborn, W.C.1.

Reeve Barlow, Ltd.—Private company. Registered November 1. Capital, £500 in £1 shares. Objects: To carry on business as manufacturers and repairers of and dealers in dynamos, motors, armatures, magnets, batteries, conductors, insulators,

transformers, convertors, switchboards, stoves, cookers, glass, pottery, rubber insulatinw and general electrical plant, &c. The directors are: T. R. Barlow, 91, Northway, N.W.11, and W. M. Bailey, "Watchers," Haslemere. Registered office: 4, Upper Marylebone Street, W.1.

A.C. Welding Co., Ltd.—Private company. Registered October 27th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of electric cutting and welding plant, accessories and supplies, ironmasters, ironfounders, steel makers, blast furnace proprietors, &c. The directors are: D. T. Smout and Louise A. Smout, both of 1, Seymour Gardens, Ilford, Essex. Registered office: 105/109, Grange Road, Plaistow, E.13.

Garman (Eastcote), Ltd.—Private company. Registered October 31st. Capital, £300 in £1 shares. Objects: To carry on the business of electrical wiring contractors, vendors of electrical and household goods, wireless apparatus, &c. The first directors are: B. C. Garman (chairman and permanent director), Crossways, Kings Road, Rayners Lane, Middlesex, and C. A. Greenslade, 33, Ovesdon Avenue, Rayners Lane, Middlesex. Registered office: 5, Deane Parade, Eastcote, Middlesex.

Returns of Electrical Companies

Bournemouth & Poole Electricity Supply Co., Ltd.—Particulars have been filed of redeemable debenture stock, to secure £400,000 with power to issue further stock provided that the total amount outstanding shall not exceed the issued share capital plus any reserve in respect of share premiums. The debenture stock was authorised on June 21st, 1934, and is covered by trust deed dated October 8th, 1934. The amount of the present issue is £400,000. The stock constitutes a first floating charge on the company's undertaking and property, present and future, including uncalled capital (subject to an indenture dated March 5th, 1900, securing 4½ per cent. debenture stock which will be redeemed on January 1st, 1935). The trustees are Sir Frederick W. P. Rutter and Henry P. Lawson.

Perrins Bros., Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares beyond the registered capital of £1,000.

Asea Electric, Ltd.—The nominal capital has been increased by the addition of £245,000 in £1 unclassified shares beyond the registered capital of £5,000.

Supra Electra Motors, Ltd.—Issue on October 17th, 1934, of £1,000 debentures, part of a series already registered.

Patersons Power Units, Ltd.—Capital, £100 in 1s. shares. Return dated July 14th, 1933 (filed September 24th, 1934). 1,689 shares taken up. £9 9s. paid, £75 considered as paid. Mortgages and charges nil.

Alfred White Electrical Co. (1931), Ltd.—Capital, £500 in £1 shares. Return dated August 28th, 1934. All shares taken up. £350 paid, £150 considered as paid. Mortgages and charges nil.

A. Berkeley, Ltd.—Capital, £10,000 in £1 shares. Return dated May 17th (filed June 2nd), 1934. 7,800 shares taken up. £7,800 paid. Mortgages and charges nil.

Meech Electric Drives, Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £5,250. The additional capital is divided into 2,000 7 per cent. cumulative preference shares of £1 each.

Unity Lamp and Accessories, Ltd.—S. H. Swallow, 28, Basinghall Street, E.C., was appointed receiver and manager by Order of Court dated October 26th, 1934.

Westminster Engineering Co., Ltd.—Satisfaction to the extent of £1,000 on October 15th, 1934, of second debentures authorised by resolution dated August 29th, 1900, and registered October 18th, 1910, securing £4,000.

T. Clarke & Co., Ltd.—Satisfaction in full on September 28th, 1934, of charge dated August 23rd, 1912, and registered September 6th, 1912. (According to the register of mortgages, the only charge registered September 6th, 1912, was an equitable mortgage which originally secured all moneys due to bank.)

Amalgamated Lamp Companies (Great Britain), Ltd.—Capital, £600 in 300 preference and 300 ordinary shares of £1. Return dated December 31st, 1933 (filed October 17th, 1934). 600 shares taken up. £301 paid, £299 considered as paid. Mortgages and charges nil.

Gayton Park Electricity Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1933 (filed August 8th, 1934). 3,000 shares taken up. £3,000 considered as paid. Mortgages and charges nil.

G.W.B. Electric Furnaces, Ltd.—Capital, £10,000 in £1 shares. Return dated July 20th, 1934. All shares taken up. £2,000 paid. Mortgages and charges nil.

Claude B. Barton, Ltd.—Capital, £1,000 in £1 shares. Return dated August 29th, 1934. 900 shares taken up. £900 paid. Mortgages and charges nil.

H. Church & Co. (Essex), Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £2,000.

City Notes

The General Cable Manufacturing Co., Ltd., particulars of whose registration appear on the preceding page, published a statement in the Press on Monday last regarding its purposes and achievements, not as an invitation to the public to subscribe, but to comply with Stock Exchange Regulations. The company was incorporated on November 1st to take over the goodwill and certain assets of the company of the same name which was formed in 1915, and to carry on, *inter alia*, the business of wire cable and general electrical manufacturers at Leatherhead. The company has specialised in all types of rubber insulated cables, aerial cables, and special cables for the motor industry. The extension of the grid and the acceleration of building programmes has increased the demand for the company's products, and it is predicted that the cable-making industry has many years of prosperity before it. The plant capacity at the works has been practically doubled during the last two years. The chairman, Mr. C. W. R. Pantlin, and Mr. E. G. Bisseker, both directors, and Mr. John Wright, the managing director of the vendor company, will continue to act in the same capacities. The statement gives figures of trading profits for seven years from 1928 down to March, 1934, as follows:—£10,308, £12,097, £9,811, £10,994, £8,330, £11,750 and £18,268. The last-stated figure is equivalent to over four times the annual dividend requirements of the 6 per cent. cumulative preference shares.

Johnson & Phillips, Ltd., have announced that owing to a satisfactory increase in business they have been able to replace the £10,000 drawn from the dividend equalisation fund in 1933, and they recommend an interim dividend of 2½ per cent., less tax. No interim dividend has been paid for the past three years, the final dividend in each case being 5 per cent. The development of subsidiary companies has progressed more rapidly than was originally contemplated; the whole of the h.p. main trunk lines are now erected and in operation, and the system of l.p. distribution mains is substantially completed. Last year the old 6 per cent. debenture stock was replaced by 4½ per cent. stock and further debenture capital was then raised to assist in the financing of these subsidiaries. By reason of rapid expansion additional capital is now required, and the directors have decided to issue 100,000 ordinary shares of £1 each, ranking *pari passu* with the existing shares, at the price of 24s. per share. This represents a bonus to shareholders, as the market price of the company's shares is 29s. 6d. Each shareholder has the right to have allotted to him one share for every six at present held. Shareholders will also have the right to apply for any excess shares that may be available. The shares now offered will bring the issued capital up to £700,000.

The Cape Electric Tramways, Ltd., reports a profit of £60,822 for the year ended June 30th last as compared with £39,937 in the preceding year, and after providing for depreciation of subsidiary companies' assets and interest, there is a balance of £23,045. It is proposed to pay a dividend of 3½ per cent. (against 2½ per cent). The report states that if railless cars are to supersede the present system a very large portion of the Cape Town companies' existing assets will have to be written off, and the directors feel that it is better to commence to make these provisions now rather than to defer them.

Electric & Musical Industries, Ltd., reports a profit for the year ended September 30th last of £420,710, before deducting £95,677 for income-tax, as compared with £902 in the preceding year. The company is paying an initial dividend of 10 per cent., and a balance of £42,618 is carried forward. The report states that sales in the British Empire increased steadily during the year. Sales in foreign countries show an unimportant increase over the previous year.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Electracts, Ltd.; Electrical Importers (Hull), Ltd.; Hardy Electric, Ltd.; Milford Haven Electric Welding Co., Ltd.; Southern Counties Radio, Ltd.

Meters, Ltd., has given notice of its intention to redeem the whole of the 4½ per cent. first mortgage debenture stock, 1897, of which £106,270 is outstanding, at the rate of £108 for every £100 of such stock. Payment is proposed to be made on May 1st, 1935, together with interest, less tax, to that date.

The Craigpark Electric Cable Co., Ltd., has decided to postpone payment of the dividend on the 6 per cent. cumulative preference shares until the accounts for the year to March 31st next are available.

The Atlas Electric & General Trust has declared a dividend of 6 per cent. per annum (less tax at 4s. 3½d.) on the preference shares for the half-year ended September 30th last.

The Western Electricity Supply Co., Ltd., has declared a final dividend of 6 per cent., plus a bonus of 10 per cent., making 20 per cent. for the year (against 15 per cent.).

Stocks and Shares

TUESDAY EVENING.

THE financial horizon is coloured a good deal at the present moment by the varying aspects of politics. At home there is fortunately, little cause in the political world to make for disturbance in the financial. Iron, coal and steel companies are doing well, as is evidenced by the issue of one good report after another by the companies engaged in the "heavy" industries. The Home Railway traffics are well-maintained, and the Board of Trade figures support the impression that business, both export and import, is going ahead. It seems a little anomalous that in spite of the increase in business, money should pile up at such a rate as to raise to boom heights the prices of gilt-edged stocks. People scoffed at the idea, not very long ago, of national credit standing upon a 3 per cent. basis. For all practical purposes that level has already been reached. Fancy now busies itself with the idea of a 2½ per cent. basis of yield as not being out of the question, and judged by the huge purchases of British Government stocks now being made by banks and other money institutions, the knowledgeable folk take the view that the 2½ per cent. basis of return is more than likely to materialise. This presses harshly, of course, upon people who have money to invest, and who find that such stocks, for instance, as those of the Central Electricity, London Passenger Transport, and other public boards, offer exceedingly modest yields on the money, when possible redemption of securities is taken into account. Central Electricity 3½ per cent. stock at 100 ex dividend looks reasonably priced, and gives 3½ per cent. on the money. The new 3½ per cent. stock, issued the other day at 93, now stands at 3½ premium. The upward movement in these gilt-edged stocks is reflected to some extent in the prices of first-class preference shares, from a good many

of which the return is scarcely more than 4 per cent. on the money.

London Passenger Transport

London Passenger Transport stocks have not changed in price on the week. An interesting point has occurred in connection with a legal case over certain shares of the old Underground Electric Railways of London. It appears that 5,933 "A" shares had not been claimed, and Counsel said he understood that some of the holders of the certificates had pasted these certificates upon the walls of their houses. The certificates for many years were regarded as practically valueless, and this was the reason why it was impossible to discover a large number of the proprietors. The judge held that the fund representing the shares and the dividends should be paid over for distribution to the Central Hanover Bank Trust Company.

The London Passenger Transport Board has given notice of its intention to promote a Bill in Parliament seeking for powers to establish trolley 'buses on 58 miles of route, an improvement scheme for the Metropolitan Line, and expansions of tube railways in various directions. This foreshadows substantial new issues of stock from time to time.

Manufacturing and Equipment Shares

Johnson & Phillips have justified the recent hopes which brought about a rise in the price of the shares from a little under 20s. to nearly 30s. by issuing a highly satisfactory report, and by recommending an interim dividend of 2½ per cent. less tax. For three years past, no interim has been paid. In addition to this, the directors have decided to issue 100,000 ordinary shares of £1 each, ranking *pari passu* with the existing shares, the new being offered at 4s. premium. One new share for every six old shares at present held is allotted. The price of the old shares is 27s. 6d. ex rights; the new shares are offered at 24s.

Siemens are unchanged at 18s. 9d. The reports of the German companies in the Siemens Electric group are now available, and show good figures. One of the reports attributes the greater demand for electrical goods to increased confidence, and the greater purchasing power of the general public. Another of the companies mentions that it has not yet suffered from the dearth of raw materials. Crompton Parkinson ordinary, after the jump of 2s. 6d. last week, are 6d. better at 33s. English Electric preference fell back a florin to 8s. 9d. Aron ordinary have recovered part of their set-back, rallying to 71s. 3d. Electric & Musical Industries issues a balance sheet and combined statement up to September 30th. It will be remembered that the parent company's profit of £420,000 went against the bagatelle of £900 in the previous year. The report speaks of good gains in trading as a whole, and, on this satisfactory showing, the price of the shares spurted to 30s.

Electricity Supply Shares

Chelsea ordinary have strengthened at 35s., and City Lights to 37s. Midland Electric Power Corporation at 48s. 9d. are $\frac{3}{16}$ better; there are rumours of a possible new issue. Edmundson's ordinary have improved to 41s. 6d. On the other hand, County of London at 56s., Metropolitans at 53s., and Bournemouths at 77s. 6d. are a little lower. Atlas ordinary gave way to 5s. 9d., a fall of about 9d. a share, on the reduction of the preference dividend from 7 per cent. to 6 per cent. This was unexpected, and caused selling. Whitehall preference went back 1s., in sympathy. British Power & Light shares are a shade harder at 20s. 6d. The market as a whole is very steady, its prices sympathising with the strength shown by gilt-edged stocks in the trustee markets.

Cables and Wireless

The all-round strength of investment and speculative investment stocks, following upon the remarkable rises in gilt-edged securities, has made, so far, no difference to the stocks of the Cables & Wireless combine. Indeed, the market has been weak for choice, as the Stock Exchange phrases it. It would appear as though some of the holders were getting tired of what is a disappointing interest, and exchanging into other stocks and shares that possess greater vitality. The preference stock is 2 points down. Both classes of ordinary have given way. Globes are unchanged. Marconi Marines fell back to 31s. 3d. Anglo-American deferred firmed up, investment taking note of the useful yield offered by the stock. Ericssons, of the construction shares, have risen to 90s. 3d. Hall's Telephone are better at 21s. 6d. There has been some inquiry for Reyrolle on the basis of 57s.

Miscellaneous Matters

Travellers who have recently returned from the United States and Canada report a better state of affairs as obtaining now than that which prevailed twelve months ago. Dollar stocks are comparatively steady. There is a readiness to pick up South Americans at what may be called bargain prices. Brazilian Tractions revolve closely around 11½. Mexicans are being neglected, but some of the Mexican Railway traffics are expanding.

Babcock & Wilcox spurted 4s. to 47s. on an all-round buying movement in the iron and steel market. Investment has been busy in this department, with the result that most shares stand higher on the week. The Rubber Market, on the other hand, is dull, because of the steady decline in the price of the raw produce.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Nov. 6.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 6
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/–	—	4 0 0
Chelsea	1	7	7	34/6	—	4 1 2
City of London	1	7½	7½	37/–	+6d.	4 1 2
Clyde Valley	1	7	7	2	—	3 10 0
County of London	1	10½	10½	56/0	–6d.	3 15 0
Edmundson's 7% Pref.	1	7	7	36/–	—	3 17 0
Elec. Dis. Yorkshire	1	9	9	49/6	—	3 12 10
Elec. Supply Corporation ...	1	11	11	58/9	—	3 14 10
Kensington Ordinary	1	7	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7½	37/6	—	4 0 0
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	53/–	–6d.	3 15 6
Midland Counties	1	7	7	37/–	–6d.	3 15 8
Mid. Elec. Power	1	8	8	48/9	+ ⅛	3 5 7
North Eastern Electric Ordinary	1	6	6	33/6	—	3 11 8
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	55/–	—	3 12 9
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary ...	1	10	10	3½	—	3 1 6
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall ...	1	7	7½	36/6	—	4 2 2
Scottish Power	1	8	8	41/6	—	3 17 2
South London	1	7	7	35/6	—	3 19 0
Westminster Ordinary	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	–1/–	7 2 10
Yorkshire Elec.	1	8	8	46/6	—	3 8 8
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	115	—	4 7 0
Do. 1955–75 ...	„	5	5	117	—	4 5 8
Do. 1951–73 ...	„	4½	4½	110	—	4 1 10
Do. 1963–93 ...	„	—	3½	100xo	—	3 10 0
London & Home Counties, 1955–75	„	4½	4½	112	—	4 0 4
London Passenger Transport, A...	„	—	4½	121½	—	3 14 0
Do. do. B...	„	—	5	125	—	4 0 0
Do. do. C...	„	—	3	87	—	3 9 0
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	110½	—	8 3 0
Anglo-Am. Tel. Pref.	Stock	6	6	114	—	5 5 2
Do. Def.	„	1½	1½	28	+½	5 7 1
Cables & Wireless 5½% Pref. ...	„	2¾	2¾	75	–2	3 13 5
Do. A. 7½% Ord.	„	Nil	Nil	16½	–½	—
Do. B. Ord.	„	Nil	Nil	7	–½	—
Globe Tel. and T. Ord.	10	Nil	2½	9½	—	2 12 0
Do. do. Pref.	10	6	6	12½	—	4 16 0
Great Northern Tel.	10	20	20	36½	+½	5 9 7
Marconi-Marine	1	10	7½	31/3	–⅛	4 16 0
Oriental Telephone Ord.	1	12	12	3½	—	*3 13 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	855	—	—
Do. do. Pref. Ord.	„	8	8	165½	—	4 16 10
Brazil Traction	100	—	—	11¾	—	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	106	—	4 14 3
Mexico Trams, 5% Bonds ...	—	5	5	21½	—	—
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	—	5	5	40	—	—
Victoria Falls Ord.	1	15	20	6¾	–½	3 2 7
Yorkshire (West Riding) ...	1	2½	5	25/–	—	4 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	10	71/3	+ ⅛	2 16 2
Assoc. Elec. Ord.	1	4	3	22/–	—	2 14 7
Do. Prf.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	47/–	+4/–	2 11 2
British Aluminium Ord.	1	5	5	29/6	—	3 7 9
British Insulated Ord.	1	15	15	75/–	—	4 0 0
Brush Ord.	Stock	Nil	Nil	43	—	—
Callender's	1	15	15	3½	—	4 12 4
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord. ...	5/–	22½	12½	33/–	+6d.	1 17 10
Do. 8% Pref.	1	8	8	33/9	—	4 14 10
Edison-Swan 1st Pref.	1	7½	7½	22/6	—	6 13 4
Electric Construction	1	Nil	Nil	13/9	—	—
Enfield Cable Ord.	1	25	20	4½	—	4 6 3
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	8/9	–2/–	—
Ever Ready	5/–	35	35	27/3	—	6 8 5
Ferranti Pref.	1	7	7	28/–	—	5 0 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	45/9	—	3 9 10
Henley's	1	30	30	6⅞	—	4 11 5
Do. 4½% Pref.	5	4½	4½	5¾	—	3 18 3
India-Rubber Preferred	1	—	—	1	—	—
Johnson & Phillips	1	5	5	27/6xr	—	3 12 9
Siemens Ord.	1	6½	4	18/9	—	4 5 4
Telegraph Construction	£1	Nil	Nil	1¼	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

452. "Electric switches or circuit-breakers." Switchgear & Cowans, Ltd., and G. H. Meet. January 6th, 1933. (417646.)

4686. "Vapour-arc convertors." General Electric Co., Ltd., and E. Gallizia. February 15th, 1933. (417848.)

6315. "Television receiving method employing Braun tubes." M. Von Ardenne. March 5th, 1932. (417590.)

6385. "Systems and apparatus for automatically controlling a circuit-breaker or the like and adapted to operate on the occurrence of an abnormal condition in an electrical circuit." I-T-E Circuit Breaker Co. March 11th, 1932. (Cognate application 6386/33.) (417591.)

6951. "Vibratory devices such, for example, as are used in the electrical recording or reproduction of sound." Electric & Musical Industries, Ltd., and A. D. Blumlein. March 7th, 1933. (417718.)

7117. "Braun tube." Radioakt-Ges. D. S. Loewe and Dr. K. Schlesinger. March 10th, 1932. (Cognate applications 18362/34, 13363/34, and 18364/34.) (417850.)

7567. "Vapour-arc convertors." General Electric Co., Ltd., and E. Gallizia. March 13th, 1933. (417853.)

7607. "Electric converting systems." British Thomson-Houston Co., Ltd. March 12th, 1932. (417854.)

7772. "Electric high-frequency discharge lamps and methods of adjusting or controlling the same." J. Pintsch Akt-Ges. May 6th, 1932 (417855.)

9473. "Optical apparatus for reproducing sound from electro-mechanically-produced records." Recherche Industrielle Francaise (R.I.F.) Soc. d'Etudes pour l'Exploitation des Brevets Nublat. March 31st, 1932. (417597.)

9798. "Electrical power systems employing storage batteries and generators driven by prime movers or energy translating devices." G. M. Pestarini. March 31st, 1933. (Cognate application 9307/34.) (417655.)

10007. "Electric power converting apparatus." International General Electric Co., Inc. April 1st, 1932. (417600.)

10040. "Electric furnaces for the heat-treatment of metallic strip." O. Junker. April 4th, 1932. (417657.)

10354. "Apparatus for recording sound upon films." C. Wright and J. Cannell. April 6th, 1933. (417603.)

10446. "Electric synchronised motion transmission systems." English Electric Co., Ltd., and R. D. Ball. April 7th, 1933. (417663.)

10522. "Apparatus for automatic regulation of electric currents." T. A. Ledward. April 8th, 1933. (417665.)

10585. "Automatic volume control for radio-receiving apparatus." L. E. Thompson and Westinghouse Brake & Saxby Signal Co., Ltd. April 8th, 1933. (417608.)

10667. "Automatic machines for treating glass bulbs such as electron tubes." Rogers Radio Tubes, Ltd. September 10th, 1932. (417667.)

10684. "Light fittings and accessories." W. E. James and E. F. R. Holroyd. April 10th, 1933. (417786.)

10709. "Electric transformers." British Thomson-Houston Co., Ltd., and C. G. Mayo. April 10th, 1933. (417787.)

10819. "Wireless signalling." G. Monteavaro. April 11th, 1933. (417725.)

10862. "Thermionic valves." H. W. Adey. April 11th, 1933. (417789.)

10953. "Electric circuit-breakers." British Thomson-Houston Co., Ltd. April 13th, 1932. (417866.)

10974. "Control of compound-wound direct-current electric motors." G. H. Fletcher and Associated Electrical Industries, Ltd. April 12th, 1933. (417867.)

10978. "Electrical power metering systems." Westinghouse Electric & Manufacturing Co. April 15th, 1932. (417795.)

10994. "Printing-telegraph exchange systems, particularly with automatic switching operation." Siemens & Halske Akt.-Ges. April 19th, 1932. (417796.)

11081. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. April 14th, 1932. (417676.)

11094. "Photographic sound-recording apparatus." Electrical Research Products, Inc. April 14th, 1932. (417874.)

11920. "Electric motor control systems." British Thomson-Houston Co., Ltd. April 22nd, 1932. (417731.)

12315. "Fluorescent screens for use in television systems." A. C. Cossor, Ltd., and L. H. Bedford. April 27th, 1933. (417679.)

13095. "Electrical fuses." H. G. Baggs. May 5th, 1933. (417802.)

13777 "Alternating-current dynamo-electric machines." G. A. Juhlin and Associated Electrical Industries, Ltd. May 11th, 1933. (417619.)

14667. "Gauges, electrical relays and like devices responsive to gas pressure." C. Sykes, C. H. Walker and Associated Electrical Industries, Ltd. May 20th, 1933. (417621.)

14924. "Electric plug-and-socket connections." Falk, Stadelmann & Co., Ltd., and S. F. Bickell. May 24th, 1933. (417805.)

18729. "Electric switch-setting mechanism for automatic control apparatus." A. H. Stevens (Bristol Co.). July 1st, 1933. (417607.)

19946. "Polyphase a.c. electricity meters." F. Holden and Measurement, Ltd. July 14th, 1933. (417889.)

22935. "Current-collecting devices for electric railway vehicles." F. Whyman and Associated Electrical Industries, Ltd. August 16th, 1933. (Addition to 404396.) (417812.)

24325. "Electric welding." British Thomson-Houston Co., Ltd. September 1st, 1932. (417692.)

25189. "Electromagnetic switches, particularly for flashing signs." C. Gorely, C. G. Dunster and E. W. N. King. September 12th, 1933. (417892.)

27333. "Thermionic valve circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. October 4th, 1932. (417627.)

32128. "Electric transformers." British Thomson-Houston Co., Ltd. November 17th, 1932. (417736.)

32762. "Apparatus for optical sound recording and reproducing." Selenophon Licht-und Tonbildges. November 26th, 1932. (417741.)

33436. "Controlling devices for arc appliances with vapour or gas discharge path." Akt.-Ges. Brown Boveri et Cie. December 10th, 1932. (417742.)

33940. "Electric cable systems." Soc. Italiana Pirelli. December 3rd, 1932. (417631.)

35896. "Electric discharge lamps." Patent-Treuhand-Ges. für Elektrische Gluhlampen. December 21st, 1932. (417747.)

1934

327. "Leading-in conductors for vitreous envelopes." General Electric Co., Ltd. January 6th, 1933. (417751.)

381. "Electric cable and method of manufacture." A. K. Croad (General Cable Corporation). January 4th, 1934. (417635.)

1300. "Electrical ozonisers." A. E. De Faveaux. January 14th, 1933. (417824.)

2967. "Recording sound photographically." I. G. Farbenindustrie Akt.-Ges. January 28th, 1933. (417753.)

3166. "Electric current collectors of the slider-shoe type." Westinghouse Electric & Manufacturing Co. February 23rd. 1933. (417754.)

3167. "Electric circuit-interrupters." Westinghouse Electric & Manufacturing Co. February 1st, 1933. (417636.)

5486. "Plug-and-socket devices with two-light switch." A. J. Frazer. February 20th, 1933. (417911.)

7300. "Electric hand torches." R. Dight. March 7th, 1934. (417828.)

7765. "Electric immersion heaters." T. Steibel. March 12th, 1934. (417638.)

8392. "Operation of flame-arc furnaces." Akt.-Ges, Brown Boveri & Cie. February 8th, 1933. (Divided application on 11196/33.) (417831.)

12013. "Electrolytic condensers." Electrizitäts Akt.-Ges. Hydrawerk. May 8th, 1933. (417836.)

12669. "Liquid-cooled thermionic valves and like arrangements." Telefunken Ges. für Drahtlose Telegraphie. May 4th, 1933. (417837.)

13770. "Manufacture of simple and multiple fixed electric condensers" Siemens & Halske Akt.-Ges. May 6th, 1933. (Cognate applications 13771/34 and 13772/34.) (417838.)

14051. "Arc-welding apparatus." J. T. Shevlin (Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken). May 9th, 1934. (417840.)

18257. "Anodic incandescent lamps." General Electric Co., Ltd. June 28th, 1933. (417643.)

18360. "Cathode-ray tubes." Radioakt.-Ges. D. S. Loewe and Dr. K. Schlesinger. March 10th, 1932. (Divided application on 417850.) (417713.)

18361. "Braun tube." Radioakt.-Ges. D. S. Loewe and Dr. K. Schlesinger. May 14th, 1932. (Divided application on 417850.) (417714.)

20223. "Signalling systems for controlling road traffic." British Thomson-Houston Co., Ltd. July 19th, 1933. (417783.)

23462. "Recording sounds." Recherche Industrielle Francaise (R.I.F.) Soc. d'Etudes pour l'Exploitation des Brevets Nublat. March 31st, 1932. (Divided application on 417597.) (417644.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 31st:—

Styroflex. No. 551315. Class 5. Wire.—Norddeutsche Seekabelwerke Gesellschaft, Nordenheim, Oldenburg, Germany. (British representatives: Marks & Clerk, 47-58, Lincoln's Inn Fields, W.C.2.)

Printo-Maxigraph. No. 551794. Class 8. Electrical measuring and recording instruments and apparatus.—Landis & Gyr Gesellschaft, Zug, Switzerland. (British representatives: D. Young & Co., 11-12, Southampton Buildings, Chancery Lane, W.C.2.)

Airsprite, No. 554216. Canary, No. 554217. Punch, No. 554218. All Class 8. Radio receiving sets.—Electrical Equipment & Carbon Co., Ltd., 107-111, New Oxford Street, W.C.1.

Williams Excelda. No. 553704. Class 11. Electric heating pads or cushions, being contrivances (not medicated) for surgical or curative purposes.—H. H. Williams, Ltd., 79, Queen Victoria Street, E.C.4.

Goodyear (lettering and design). No. 547295. Class 17. Electrical conduits manufactured from asphalt, fibres and diatomaceous earths.—Goodyear Tire & Rubber Co., Akron, O., U.S.A. (British representatives: Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2.)

The New Zealand Battery Market

Factors which have militated against an increase in Great Britain's share of the New Zealand electric battery market are suggested in a confidential report prepared by the Trade Commissioner at Wellington and published by the Department of Overseas Trade. While fluctuations in the sources of these imports are naturally due largely to currency and tariff considerations, the Commissioner is led to believe that American and Canadian batteries have been more freely advertised than those from the United Kingdom, and the Australians, who have now secured a large share of the trade, also advertise considerably. With regard to motor-car batteries, an important point seems to be that Australian and American manufacturers use hard rubber cases for their first quality batteries, these being considered in New Zealand infinitely superior to composition cases, such as are supplied by United Kingdom manufacturers. With regard to dry batteries, it appears that the United Kingdom makes do not always emerge satisfactorily from a comparison with American and Canadian types, although they have been much improved in recent times. This may be partly due to the fact that British batteries are sometimes sent to New Zealand packed in non-waterproof paper and light wooden crates, and do not always arrive in first-class condition.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Annfield Plain.—Houses (110), Clavering Place; J. N. Elliott. surveyor.

Ashton-in-Makerfield.—Houses (36), Heath Road; U.D.C. surveyor.

Ayr.—Houses (16) and bungalows (£9,100), Lothian Road, for E. Ecrepont, Berelands Road, Prestwick.

Ayrshire.—Cinema, Prestwick; Alastair MacDonald, architect.

Banff.—Swimming pool and tearooms (£6,500); burgh surveyor.

Barnet.—Extensions, isolation hospital (£20,000); Alfred Saxon Snell & Phillips.

Barrow-in-Furness.—Houses, Ocean Road; borough engineer.

Becontree.—Church, Goresbrook Road; London Baptist Property Board, Ltd.

Bishop Auckland.—Extensions to Grammar School (£9,750); G. W. Lazenby & Co., Ltd.

Bishop's Stortford.—Houses (38); W. G. Parker, builder, High Ongar.

Blackpool.—Houses (22), Lindale Gardens North; W. J. Magee. Houses (28), Newhouse Road; M. Diamond. Houses (20), Park Drive; E. Saville. Houses (52), Warbreck Hill Road; R. Fielding & Son. Houses (41), Countess Crescent, and hotel, Queen's Drive; Sir L. Parkinson & Co. Hotel, South Shore; Sir Arthur du Cros. Underground garage (£150,000), for Corporation Highways Committee.

Bradford.—All-electric printing factory, Bingley Road, Heaton, for W. N. Sharpe, Ltd.; Chippendale & Edmondson, architects, Hustlergate.

Brentwood.—Public baths (£7,717) and houses, Green Lane; U.D.C. surveyor.

Bridge (KENT).—New Council offices (£2,500); K. B. Mackenzie, architect.

Bromley.—Houses (360), Southborough, for New Ideal Homesteads, Ltd.

Brotherton (PONTEFRACT).—Houses (62), Cliff Wood, for Cliff Wood Building Estate Co.

Bungay.—Houses (26), Flixton Road; F. J. Meen, architect, Station Road, Beccles.

Cambridgeshire.—Three senior schools (£46,130) for County E.C.

Cannock.—Senior schools (640 places), Littleworth Lane, for E.C.; S. Harrison, architect.

Caterham.—Houses (120), Chaldon Common Lane; Batchelor & Son.

Chelmsford.—Houses (13), Arbour Lane, &c.; E. H. Howard.

Chertsey.—Houses (1,087) and shops, Woodham Grange Farm Estate; W. Holly.

Cheshire.—Library, Cheadle Hulme, for County E.C.; F. A. Browne, county architect, The Castle, Chester.

Cumberland.—Central school, Penrith, for County E.C.; G. B. Brown, director of education, Carlisle.

Dartford.—Houses (168), Heath Lane Estate, and civic centre; borough engineer.

Dewsbury.—Houses (203), Lees Moor and 103 houses, Heaton Lodge; borough engineer.

Dorset.—Technical school, Weymouth, for County E.C.; county architect, Dorchester. Grammar school extensions, Weymouth and Dorchester (£12,395); D. R. Dunthorne & Son, builders, Glastonbury.

Dunfermline.—Maternity home and hospital; T. Rutherford, architect.

Durham.—Hospital, Dryburn (£240,002); county architect.

Eccles.—Houses (126), Winton, electrical work; T. H. Mitchell, Ltd., Davyhulme.

Edinburgh.—Houses (32), Gylemuir Property Co., Ltd., Turnhouse Road; J. A. W. Grant, 25, Rutland Squire.

Epping.—Houses (23); R.D.C. surveyor.

Essex.—Technical college, Walthamstow (£130,000), with electrical engineering department, for County E.C.; J. Stuart, county architect, Chelmsford.

Gillingham (KENT).—Public library; borough surveyor.

Glasgow.—Houses (189); Corporation Architect, housing dept.

Guildford.—Two schools for Borough E.C. (£29,097); H. W. Fisk, builder, Godalming.

Hampshire.—Schools, Butlock's Heath and Millbrook; county surveyor.

Hartlepool.—Houses (300), slum clearance scheme; A. B. Horsley, borough engineer.

Hatfield.—Houses (100), Birchwood Estate, for Miskin & Sons, Ltd.

Heckmondwike.—Houses (26) (electrical work), Hill Top; U.D.C. surveyor.

Hertfordshire.—New schools (£314,000); county surveyor.

Huntingdonshire.—Conversion of Ramsey Abbey into grammar school (£4,500) and extensions, Kimbolton Grammar School (£6,500), for County E.C.; Mr. Longstaff, county surveyor, Huntindgon.

Ilford.—Houses (563), Clayhall Park Estate; Lord & Mellodew, Ltd. Houses (50), Staines Road; W. Goodchild & Co. Factories, Forest Road and High Road; J. T. Perrin.

Irish Free State.—(MIDLETON, Co. CORK).—Hospital, for the South Cork County Board of Public Assistance, of County Home, Cork; B. O'Flynn, architect, 60, South Mall, Cork.

Kent.—Central school for girls, Tonbridge, for County E.C.; education architect, Maidstone.

Kettering.—Additions to works, Green Lane, for T. Beaty Hart, Ltd.; T. Hewitt, builder, Digby Street.

Leatherhead.—Congregational Church (£9,900); W. H. Gaze & Sons, builders, Kingston-on-Thames.

Leeds.—Hotel, for Corporation Housing Committee.

Llandudno.—Houses (36), Penrhyn Bay, for T. Emery.

London.—(BALHAM).—Extensions, St. James's Hospital (£7,323); Burnand & Pickett, Ltd. (E.C.)—New building, Victoria Embankment, for the Associated Newspapers, Ltd. (FRIERN BARNET).—Development of Sydney Road and Alexandra Road; Hamilton Hill & Evershed, for Mr. R. C. Allen. (HAMMERSMITH).—Extensions, Poor Law Institution (£5,225); W. Walkerdine, Ltd. (HANWELL).—Laundry modernisation, Mental Institution (£14,400); L.C.C. architect. (WESTMINSTER).—Dwellings (280) and shops, Ebury Bridge site (£159,786); City Council. New Westminster Hospital; Adams, Holden & Pearson.

Maidenhead.—Houses (28), Blackamoor Lane, for F. W. Harmer.

Maldon (ESSEX).—Houses (59), Park Drive Estate; borough surveyor.

Manchester.—Houses (140), various estates, by direct labour; city architect. Houses (73) and shops on Kingsway and Burnage Lane, East Didsbury; Drury & Gomersall, architects, Imperial Buildings, Oxford Road. Cinema, Deane Lane, Lightbourne, for Victory Picture Manchester, Ltd., 7, Oxford Road; H. Yearsley, architect, 7, Oxford Road. Operating block, including theatre (£9,400), Withington Hospital; city surveyor. Two-storey building to works, for Ingersoll Rand & Co., Ltd., Lyons Road, Trafford Park; J. Gerrard & Sons, Ltd., builders, Swinton. Extensions, Yew Tree Senior School; E. Taylor & Co., Ltd.

Mansfield.—Houses (49), Firbeck Avenue, Firbeck Crescent and Lyndhurst Lane; F. T. Fowler, builder, Big Barn Lane.

Market Drayton.—Factory, Kiln Bank, for the Market Drayton Canning Co., Ltd.; A. W. Moss, architect, 13, Church Street, Hanley.

Market Harborough.—Houses (40) and bungalows; Coales & Green, architects, 35, High Street.

Merthyr Tydfil.—Central library; Johnson, Richards & Rees, architects, Glebeland House.

Middlesex.—School, Ruislip Road, Greenford; County surveyor.

Midhurst (SUSSEX).—Houses (35); R.D.C. surveyor.

Motherwell.—Cinema (£45,000), electrical work; Cinema Construction Co., builders, 154, West Regent Street, Glasgow.

Neath.—Houses (250); R.D.C. surveyor.

Newark.—Houses (66), Hawtonville Estate; borough surveyor.

Newcastle-under-Lyme.—Maternity home, Brompton Tree House (£18,000); Martin & Martin and W. H. Ward, architects, 105, Colmore Row, Birmingham.

Newmarket.—Houses (54); A. E. Austin, R.D.C. surveyor, White Lodge, Exning Road.

Northallerton.—New factory, for the Dried Milk Products, Ltd.

Northumberland.—Modernisation of Poor Law Institution, Alnwick (£20,000), for C.C. New school (£19,250), near Longhirst, for County E.C.; W. W. Tasker, architect, County Hall, Newcastle-on-Tyne.

Redruth.—Houses (40), North Close; U.D.C. surveyor.

Renfrewshire.—School, Giffnock, for County E.C.; architect, Education Committee, Paisley.

Rothwell.—Houses (50); Sunnyside Estates Co., Lofthouse.

St. Ives (HUNTS).—Houses (£8,226); W. Canham, builder.

St. Leonards-on-Sea.—Houses, Filsham Road; J. W. Cobb.

Scunthorpe.—Houses (50), Crosby Estate; U.D.C. surveyor.

Sevenoaks.—Church, Otford, for the Methodist trustees; Rev. A. J. Bromwich.

Southall.—Houses (60), Allenby Road; U.D.C. surveyor.

South Shields.—Houses (256), West Harton; J. Reid, borough engineer, Town Hall.

Stafford.—Houses (58), Tillington Estate; W. Plant, borough engineer.

Staffordshire.—Junior school (350 places), Darlaston; education architect, Stafford. School, Sedgley (£31,550), and extensions, Redhall School, Sedgley (£4,300), and Robert Street School, Sedgley (£5,300); H. Lea & Son, consulting electrical engineers, Birmingham.

Stockport.—Cinema and shops junction of Woodford Road and Birch Road, Bramhall, for C. Greenhalgh, Bournemouth; Briggs & Co., builders, Heaton Norris. Junior school (£16,127), for Borough E.C.; director of education. Rebuilding, Oakwood Mill, Romiley, for Textile Paper Tube Co., Ltd.; W. A. Lowry, architect, 41, Arcade Buildings, Lord Street, Liverpool.

Stoke-on-Trent.—Houses (122), Longton Hall Estate, Longton; G. & F. Wootton, builders, Pinfold, Bloxwich.

Stroud.—Houses (69), Bourne House Estate, for the Manor Building Co., Ascot.

Surrey.—Police Houses (£150,000), for the Standing Joint Committee; clerk, Kingston-on-Thames.

Tadcaster.—Houses (40); J. H. Gilbert, builder.

Teddington.—Estate development of Broom Road; Kenley Claremont Building Co., Ltd.

Todmorden.—Houses (102), various estates; borough engineer.

Torquay.—Public library, Lymington Road (£27,000), and Town Hall extensions (£10,000); P. W. Ladmore, borough surveyor.

Tynemouth.—Aerodrome, Preston; borough engineer.

Uttoxeter.—Cinema, High Street, for a local syndicate; Naylor, Sale & Widdows, architects, St. Mary's Chambers, St. Mary's Gate, Derby.

Uxbridge.—New station, High Street, and Coach and Bus Station, &c. (£250,000), for the London Passenger Transport Board.

Walsall.—School extensions (£9,500), for Borough E.C.; director of education.

Watford.—Reconstruction of Boys' Grammar School (£18,622); school governors.

Welwyn Garden City.—Houses (78); U.D.C. surveyor.

West Riding.—School, Whitwood Mere, for County E.C.; director of education, Wakefield.

Worthing.—School (£11,432), for Borough E.C.; J. Bodle, Ltd., builders, Brighton. Thirty-six shops, Tarring Rd.; H. M. Potter.